

# Tactical Control System Segment to Air Vehicle Standard Segment Interface Design Description



Prepared for:  
Program Executive Officer, Cruise Missiles Project  
and Unmanned Air Vehicles Joint Project

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Date: \_\_\_\_\_

| <b>Change Driver</b> | <b>Description</b>  | <b>Part of Document Affected</b>                  |
|----------------------|---|---|
| STR RD0021           | Allow transition of payload between manual and waypoint control while AV is in waypoint control.                          | AV EOIR Command Message                           |
| STR RD0022           | Command calibration of the Gain setting for the Predator Versatron Skyball EO/IR payload.                                 | AV EOIR Command Message                           |
| STR RD0023           | Allow Rate Control of EO/IR Payloads  | AV EOIR Command Message                           |
| STR RD0033           | Change range values for payload horizontal and vertical field of view in the AV EOIR Status Message to $0 \leq x \leq 90$ | AV EOIR Status Message                            |
| STR RD0059           | Add Predator Specific range values for the EO_Payload_Camera_Select_Field in the AV_EOIR_Command Message                  | AV EOIR Command Message<br>AV EOIR Status Message |

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## **1. Scope**

This document defines the interface between the Air Vehicle Standard Segment and the TCS Real Time Processing Segment. For the implementations of TCS for the foreseeable future, the Air Vehicle Standard Segment shall be implemented as a Datalink Control Module (DCM).

### **1.1 Tactical Control System Introduction**

The purpose of the Tactical Control System (TCS) is to provide the military services with a single command, control, data receipt, data processing, data export and dissemination system that is interoperable with the family of all present and future tactical unmanned aerial vehicles (UAVs). These UAVs shall include the Tactical Unmanned Aerial Vehicle (TUAV) and the Medium Altitude and Endurance (MAE) UAV (henceforth referred to as Outrider and Predator respectively), their associated payloads, and other network communication systems. TCS will also be capable of receiving and processing information from High Altitude and Endurance (HAE) UAVs, their associated payloads, and future development UAVs and payloads.

#### **1.1.1 TCS Program, Phases, and UAV Interaction**

The Unmanned Aerial Vehicle Joint Project Office (UAV JPO) has undertaken development of a TCS for UAVs. Design and development of the TCS will be conducted in two phases. Phase 1 is defined as the Program Definition and Risk Reduction phase, and Phase 2 is defined as the Engineering and Manufacturing Development phase in accordance with Department Of Defense Instruction (DODI) - 5000.2R. During Phase 2, TCS Low Rate Initial Production (LRIP) will commence. Phase 1 will be a 24 month period and will demonstrate Level 1 through Level 5 interaction (as defined below) in an Incremental and Evolutionary strategy as described in accordance with MIL-STD-498. The five discrete levels of UAV interaction to be provided by the TCS are:

Level 1: receipt and transmission of secondary imagery and/or data

Level 2: direct receipt of imagery and/or data

Level 3: control of the UAV payload in addition to direct receipt of imagery/data

Level 4: control of the UAV, less launch and recovery, plus all the functions of level three

Level 5: capability to have full function and control of the UAV from takeoff to landing

### **1.1.2 Tactical Control System**

The TCS consists of the software, software-related hardware and the extra ground support hardware necessary for the control of the TUAV, the MAE UAV, and future tactical UAVs. The TCS will also provide connectivity to specifically identified Command, Control, Communications, Computers, and Intelligence (C4I) systems. TCS will have the objective capability of receiving High Altitude Endurance (HAE) UAV payload information. Although developed as a total package, the TCS will be scaleable to meet the user's requirements for deployment. TCS will provide a common Human-Computer Interface (HCI) for tactical airborne platforms to simplify user operations, training, and facilitate seamless integration into the Services' joint C4I infrastructure across all levels of interaction.

#### **1.1.2.1 Software**

The major focus of the TCS program is software. The software will provide the UAV operator the necessary tools for computer related communications, mission tasking, mission planning, mission execution, data receipt, data processing, limited data exploitation, and data dissemination. The software will provide a high resolution computer generated graphics user interface that enables a UAV operator trained on one system to control different types of UAVs or UAV payloads with a minimum of additional training. The TCS will operate in an open architecture and be capable of being hosted on computers that are typically supported by the using Service. Software developed will be Defense Information Infrastructure / Common Operating Environment (DII/COE) compliant, non-proprietary, and the architectural standard for all future tactical UAVs. To the extent possible, the TCS will use standard Department of Defense (DoD) software components to achieve commonality. TCS will provide software portability, scaleable functionality, and support for operational configurations tailored to the users' needs.

#### **1.1.2.2 Hardware**

To the extent possible, the TCS will use standard DoD components in order to achieve commonality. The TCS will use the computing hardware specified by the service specific procurement contracts. The individual armed services will identify TCS computing hardware, the desired level of TCS functionality, the battlefield C4I connectivity, and the particular type of air vehicle and payloads to be operated depending upon the deployment concept and area of operations. TCS hardware must be capable of being scaled or modularized to meet varying Service needs. TCS hardware will permit long range communications from one TCS to another, data storage expansion, access to other computers to share in processing capability, and multiple external peripherals.

### 1.1.3 Integration with Joint C4I Systems

TCS integration with C4I systems will be accomplished through development of interfaces that permit information exchange between the TCS and specified C4I systems. TCS will be capable of entering DII/COE compliant networks. Network interoperability will include but not be limited to:

- Advanced Tactical Weapons Control Station (ATWCS)
- Advanced Field Artillery Tactical Data System (AFATDS)
- Air Force Mission Support System (AFMSS)
- All Source Analysis System (ASAS)
- Automated Deep Operations Coordination System (ADOCS)
- Automated Target Hand-off System (ATHS)
- Closed Circuit Television (CCTV)
- Common Operational Modeling, Planning, and Simulation Strategy (COMPASS)
- Contingency Airborne Reconnaissance System (CARS)
- Enhanced Tactical Radar Correlator (ETRAC)
- Guardrail Common Sensor (GRCS)/Aerial Common Sensor (ACS)  
Integrated Processing Facility (IPF)
- Intelligence Analysis System (IAS)
- Joint Deployable Intelligence Support System (JDISS)
- Joint Maritime Command Information System (JMCIS)
- Joint Service Imagery Processing System - Navy (JSIPS-N)
- Joint Surveillance Target Attack Radar System (JSTARS) Ground Station  
Module/Common Ground Station (GSM/CGS)
- Modernized Imagery Exploitation System (MIES)
- Tactical Aircraft Mission Planning System (TAMPS)
- JSIPS Tactical Exploitation Group (TEG)
- Theater Battle Management Core System (TBMCS)
- TROJAN Special Purpose Integrated Remote Intelligence Terminal  
(SPIRIT) II

The TCS will export and disseminate UAV imagery products, tactical communication messages, as well as mission plans and target coordinates. TCS will also receive, process, and display tasking orders, and operational information from Service specific mission planning systems.

### 1.1.4 System Compliance

The TCS will be developed in compliance with the following military and

commercial computing systems architecture, communications processing, and imagery architecture standards:

- a) Defense Information Infrastructure (DII) / Common Operating Environment (COE)
- b) Computer Open Systems Implementation Program (COSIP)
- c) Common Imagery Ground/Surface System (CIGSS) Handbook
- d) Variable Message Format (VMF) and Joint Message Format (JMF)
- e) National Imagery Transmission Format (NITF)
- f) Assistant Secretary of Defense (ASD) (C3I) Joint Technical Architecture (JTA)
- g) Airborne Reconnaissance Information Technical Architecture (AIRTA)

## **1.2 Document Overview**

This document defines the requirements and design of the TCS Standard Segment to Air Vehicle Standard Segment Interface (AV Standard Interface). This document was developed using MIL-STD-498 (Data Item Description DI-IPSC 84136) as a guide. A requirement section was added to allow this document to function as both an Interface Requirements Specification and an Interface Design Description. The document is divided into the following sections:

Section 1 - Scope: Provides a description of the overall development effort and objectives of the program.

Section 2 - Applicable Documents: Lists all reference documents applicable to this development effort.

Section 3 - Requirements: Defines the requirements imposed on the interface by higher level documents. Expands and clarifies interpretation of higher level requirements.

Section 4 -Interface Design: Defines the design of the interface. This includes the interface hardware as well as the messages transferred across the interface.

Section 5 - Requirement Traceability: Defines the traceability of the requirements of this interface to higher level requirements.

Section 6 - Notes: Provides background information on the intended uses of the system. Also included in this section is a list of acronyms.

Section 7 - Predator Specific Appendix: Provides any Predator specific implementation data.

Section 8 - Outrider Specific Appendix: Provides any Outrider specific implementation data.

## 2. Applicable documents

|   |   |
|---|---|
| MIL-STD-498 5 Dec. 94                   | Software Development and Documentation                      |
| DI-IPSC-81436 5 Dec. 94 MIL-STD-498 DID |   |
| RFC 1014                                | External Data Representation Standard                       |
| DODI 5000.2R                            | Department Of Defense Instruction                           |
| TCS 102                                 | Tactical Control System System Subsystem Specification      |
| TCS 104                                 | Tactical Control System System Subsystem Design Description |

## 3. Requirements

AVSTD1 - The AV Standard interface shall provide a reliable transport mechanism to pass messages between the TCS and the AV Standard Segment.

AVSTD2 - The AV Standard interface shall support levels 2 through 5 of UAV interaction defined in the TCS Joint Operational Requirements Document.

AVSTD3 - The AV Standard interface shall provide the functionality required to operate with the Predator and Outrider UAVs.

AVSTD4 - The AV Standard interface shall be based on a standard, open system, network interface.

AVSTD5 - The AV Standard Interface is Mission Critical during level 2 operations and both Mission Critical and Flight Critical during levels 3, 4 and 5 operations. As a minimum, the portion of the AV Standard Interface that supports Flight Critical operations shall be segregated from other networks and interfaces in the TCS system.

AVSTD6 - The AV Standard interface shall be designed to be stable and pseudo-deterministic.

AVSTD7 - The AV Standard interface shall be capable of passing two analog RS-170 video feeds from the AV Standard Segment to the TCS.

AVSTD8 - The AV Standard interface shall be scaleable to provide high bandwidth digital service to support digital video and imagery applications.

AVSTD9 - The AV Standard interface shall be easily scaleable to provide the messages and data fields required to safely command any fixed wing

unmanned air vehicle which has an autopilot which controls flight surfaces and understands waypoints.

AVSTD10 - Intentionally deleted.

AVSTD11 - The AV Standard Interface shall not support the direct control of AV flight surfaces except while the AV is undergoing maintenance or preflight checkout on the ground. The interface shall only pass flight path commands to the autopilot.

AVSTD12 - The AV Standard interface shall have the capability to transfer flight route plans from the TCS to the DCM.

AVSTD13 - The AV Standard interface will provide the functionality to command all EO/IR payloads currently on the Predator or the Outrider UAVs. For version 1.0 of this IDD, the payloads supported shall be the Versatron Skyball for Predator and the Israeli Aircraft Industries POP-100 for Outrider.

AVSTD14 - The AV Standard interface will provide the functionality to receive all telemetry and products from all payloads currently on the Predator or Outrider UAVs. For version 1.0 of this IDD, the AV Standard interface shall support the receipt of telemetry and imagery from the Versatron Skyball for Predator, and the Israeli Aircraft Industries POP-100 for Outrider. The AV Standard interface shall support the receipt of telemetry from the Predator SAR payload.

AVSTD15 - The AV Standard interface shall be scaleable to command future payloads to be carried by an UAV that is integrated with TCS.

AVSTD16 - The AV Standard interface shall be scaleable to receive telemetry and products from future payloads carried by an UAV that is integrated with TCS.

AVSTD17 - The AV Standard Interface shall have adequate bandwidth to support transfer of all available commands, telemetry, and imagery available from the AV with an average utilization less than 50%.

AVSTD18 - If the AV Standard Interface does not have its own dedicated physical interface, then the total average utilization of the physical interface including the AV Standard Interface and any other traffic present shall be less than 25%.

AVSTD19 - Intentionally deleted.

AVSTD20 - Intentionally deleted.

AVSTD21 - Intentionally deleted.

AVSTD22 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to command and monitor the Satellite Communications (SATCOM) Air Data Terminal on all AVs that have been integrated with TCS and have a SATCOM capability.

AVSTD23 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to fully command and monitor the Identify Friend or Foe capability of all AVs that have been integrated with TCS.

AVSTD24 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to switch the data link between LOS and SATCOM while the AV is in operation.

- AVSTD25 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to command and monitor the LOS ADT antenna selection, pointing, and transmission modes.
- AVSTD26 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to command and monitor the LOS ADT transmit power, transmit frequencies, and receive frequencies.
- AVSTD27 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to command and monitor the SATCOM ADT antenna pointing and transmission mode.
- AVSTD28 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to command and monitor the SATCOM ADT transmit power, transmit frequencies, and receive frequencies.
- AVSTD29 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to send ephemeris data required by the SATCOM ADT to the AV.
- AVSTD30 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to dynamically change the AV flight path by commanding heading, altitude, and airspeed.
- AVSTD31 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to dynamically command an Electro-Optical (EO) payload's operating parameters, including azimuth, depression, iris, and zoom.
- AVSTD32 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to dynamically command an Infrared (IR) payload's operating parameters, including, azimuth, depression, polarity, zoom, and gain.
- AVSTD33 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to dynamically command the Synthetic Aperture Radar (SAR) payload's operating parameters, including, TBD.
- AVSTD34 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to command and monitor the AV's emergency recovery system if the AV has an emergency recovery system.
- AVSTD35 - The AV Standard Interface shall provide the capability to transfer to the TCS the status of all subsystems on the AV that report status information.
- AVSTD36 - The AV Standard Interface shall be designed to support the capability to monitor the payload of an AV that is being flown by another TCS.
- AVSTD37 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to select, command, and monitor all of the navigation systems present on the AVs which have been integrated with TCS. The navigation system types currently supported are Inertial Navigation System (INS), Global Positioning System (GPS), barometric altimeter, radar altimeter, and magnetometer.

AVSTD38 - The AV Standard Interfaces shall be capable of transferring the data required to allow TCS to run AV maintenance software and report the status and results to the TCS.

AVSTD39 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to override the automated navigation systems in the AV and set the flight path manually with autopilot commands.

AVSTD40 - The AV Standard Interface shall be designed such that no single hardware failure or software error results in an unsafe command to be transmitted to and accepted by the air vehicle. The AV Standard interface shall be built on the guaranteed delivery services of TCP and all messages sent across the AV Standard interface shall contain a check sum.

AVSTD41 - The AV Standard Interface shall be designed to support the hand off of AVs between two different TCSs.

AVSTD42 - The TCS shall be capable of transferring the data required to allow TCS to perform flight route plan upload through the DCM to the AV via the selected system data link or direct ground connection.

AVSTD43 - The Flight Route Plan, as a minimum, shall include AV flight path information, Loss of Link plan, AV VCR control tasking if supported, and data link control information if supported.

AVSTD44 - Intentionally deleted.

AVSTD45 - The AV Standard Interface shall be capable of transferring the data required to allow TCS receive of AV analog payload video information from the DCM. Analog video shall be received in RS-170A format.

AVSTD46 - The AV Standard Interface shall support the capability to sequentially control and monitor multiple AVs.

AVSTD47 - The AV Standard Interface shall support flight controls that provide Operator command and Autonomous Control with operator override.

AVSTD48 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to control the flight of the selected AV in accordance with the specific AV's operational performance capabilities.

AVSTD49 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to perform air vehicle flight control beyond line of sight via up link command to two air vehicles of the same type using sequential communication techniques.

AVSTD50 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to control the flight behavior characteristics inherent to the selected AV.

AVSTD51 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to initiate or change flight behaviors by sending the proper control commands to the UAV.

AVSTD52 - The AV Standard Interface shall be capable of communicating fuel parameters to the TCS to include as a minimum, fuel status, flow rate, and bingo fuel.

AVSTD53 - The AV Standard Interface shall support the necessary system capabilities required for payload control beyond line of sight via up link

command of two air vehicles of the same type using sequential communication techniques.

AVSTD54 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to control the payload via preprogrammed or manual commands, assuming the AV supports each mode of operation.

AVSTD55 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to receive, process, and present payload data to the operator so that the status of the payload can be determined.

AVSTD56 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to automatically control the payload using the methods supported by the AV payload being controlled.

AVSTD57 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to override payload automated or preprogrammed inputs.

AVSTD58 - Intentionally deleted.

AVSTD59 - Intentionally deleted.

AVSTD60 - Intentionally deleted.

AVSTD61 - The AV Standard Interface shall be capable of transferring the data required by TCS to determine target coordinates.

AVSTD62 - The AV Standard Interface shall be capable of transferring the data required by TCS to estimate target coordinate accuracy.

AVSTD63 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to control and monitor the AV's Fault Detection/Location (FD/L).

AVSTD64 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to control and monitor the Payload's FD/L.

AVSTD65 - The AV Standard Interface shall be capable of transferring the data required to allow TCS to control and monitor the data link FD/L when the AV Data link Control Module is controlling the data link.

AVSTD66 - The AV Standard Interface shall support a concurrent up link and down link capability.

AVSTD67 - The AV Standard Interface shall provide the capability to transfer a caution/warning to the TCS when the UAV and/or DCM have identified a malfunction.

AVSTD68 - Intentionally deleted.

AVSTD69 - The AV Standard Interface hardware shall support the data rate characteristics of the AV, data link and payload to ensure interoperability.

AVSTD70 - For each TUAV system, the AV Standard Interface shall support TCS full independent computer redundancy.

AVSTD71 - Intentionally deleted.

AVSTD72 - THE AV Standard Interface throughput shall not exceed 50% of the throughput capability delivered. For a 10 megabit per second Ethernet connection, the throughput shall not exceed 400 kilobytes per second when measured over any 5 second interval. TCP/IP overhead shall be included in the calculation. Ethernet overhead will not be included in the calculation.

AVSTD73 - As an objective, AV Standard Interface throughput shall not exceed 25% of the throughput capability delivered. For an 10 megabit per second Ethernet connection, the throughput shall not exceed 200 kilobytes per second when measured over any 5 second interval. TCP/IP overhead shall be included in the calculation. Ethernet overhead will not be included in the calculation.

AVSTD74 - The AV Standard Interface software shall be non-proprietary. The AV Standard Interface shall be based on a Berkley Sockets implementation.

AVSTD75 - The AV Standard Interface data latency shall not be greater than that present in the Predator ground control station or the Outrider ground control station, which ever is smaller. The latency from queuing of messages to be transferred across the AV Standard Interface shall not exceed TBD milliseconds. This does not include the mandatory throttling of commands by the TCS RTP or the DCM not to exceed maximum message frequencies.

AVSTD76 - Intentionally deleted.

AVSTD77 - Hardware and software shall be selected for use in the AV Standard Interface with the goal of providing ease of future changes to the AV Standard Interface elements. The object of portability for the AV Standard Interface is to select or develop hardware which will readily host emerging software packages and software which will be as independent of host hardware as possible.

AVSTD78 - The selection of interface cards for communications interfaces, video, networking equipment, and all other hardware for use in the AV Standard Interface shall be made according to standards for production of an open architecture.

AVSTD79 - Control techniques to minimize electromagnetic interference, emanation, and susceptibility shall be incorporated into the design of AV Standard Interface equipment.

AVSTD80 - A modular architecture shall be used by the AV Standard Interface software and data elements in order to support future interoperability with multiple types of UAVs and payloads while maintaining consistent system interfaces.

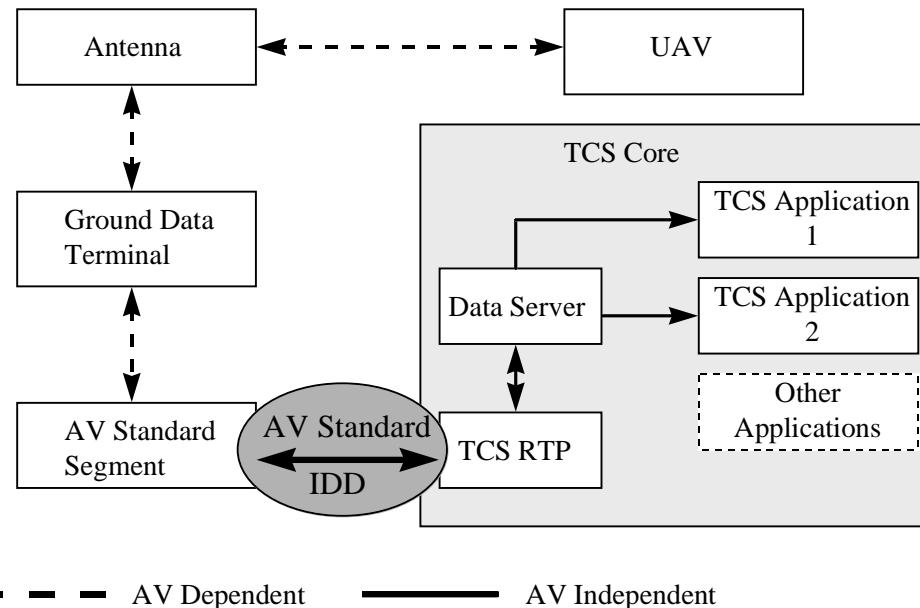
AVSTD81 - AV Standard Interface hardware flexibility and expansion shall be provided through use of GFE, NSDI and COTS hardware designed to be upgraded and expanded.

## 4. Interface design

### 4.1 Interface identification and diagrams

This document defines the interface between the Air Vehicle Standard Segment and the TCS Real Time Processing Segment. For the implementations of TCS for the foreseeable future, the Air Vehicle Standard Segment shall be implemented as a Datalink Control Module (DCM).

## TCS/AV Data Flow



**Figure 4.1-1 TCS Data Flow**

## 4.2 Command and Telemetry interface

This section describes the command and telemetry interface between the TCS Real Time Processing (RTP) and the Datalink Control Modules (DCMs).

### 4.2.1 Physical Interface

This section describes the physical interface between the TSC RTP and the DCMs.

#### 4.2.1.1 Near Term Interface

For TCS Phase 1 demonstrations, an implementation using 10Base2 Ethernet (Thinnet) will be used. The Thinnet segment used to implement this interface shall be a standalone segment that does not pass through any hubs or repeaters. This reduces the amount of hardware that is flight critical. The only devices to be connected to this Thinnet segment shall be the Air Vehicle Datalink Control Modules and the TCS Real Time Processor. This is to ensure the AV Standard Interface, which is flight critical, will not experience any interference or degradation in capability due to other network traffic. This is

extremely important to maintain when connecting the TCS to external C4I networks.

This implementation shall use TCP/IP Berkley sockets. The TCS shall act as a sockets client and the Datalink Control Modules (DCMs) shall act as servers. The TCS is responsible for initiating all TCP/IP connections. This interface shall be implemented in a manner to allow transition to a different physical interface still using TCP/IP sockets with little or no source code change required. The port names are defined below.

| System                     | Port Name                 |
|----------------------------|---------------------------|
| TCS                        | TCS_AV_Standard_Interface |
| AV Datalink Control Module | DCM_AV_Standard_Interface |

**Table 4.2.1-1 Port Name Assignment**

For Phase 1, IP addresses assigned to the TCS Real Time Processor, and the Air Vehicle Datalink Control Modules shall be static. IP addresses shall be assigned as specified in the table below. The manufacturer of each component is responsible for ensuring the IP address assigned to that component is configurable without the use of additional hardware.

| System                                       | IP Address Range     |
|--|----------------------|
| Reserved                                     | X.X.X.1 - X.X.X.20   |
| TCS Real Time Processor                      | X.X.X.21 - X.X.X.40  |
| Predator Datalink Control Module             | X.X.X.41 - X.X.X.60  |
| Outrider Datalink Control Module             | X.X.X.61 - X.X.X.80  |
| Reserved for Growth Datalink Control Modules | X.X.X.81 - X.X.X.255 |

**Table 4.2.1-2 IP Address Assignment**

## **4.2.2 Data Elements**

The command and telemetry interface is a real time message passing interface. All data elements shall comply with ARPA Standard RFC1014 External Data Representation Standard. Specifically, all data elements shall map to the XDR data types Integer, Unsigned Integer, Double-precision Floating Point (Double), or String. This implies big-endian byte order, 32-bit integer, and 64-bit floating point representation.

## **4.2.3 Message Architecture**

Messages shall be treated as packets at the application level. No fragmentation of messages shall be allowed at the application level. Messages shall be immediately preceded by a START\_SYNC. All messages shall be a length that is a multiple of 4 bytes. Message length does not include the TCP header,

START\_SYNC, and message checksum fields, but does include the message length. Messages shall be followed by a 32-bit message checksum. The entire message structure shall be the sole payload of a TCP datagram. The message structure, with TCP header included, is depicted in Table 4-1. XDR Remote Procedure Calls (RPC) shall not be used to implement this interface.

| Field            | Size in bytes | Value                   |
|------------------|---------------|-------------------------|
| TCP Header       | 20            | Defined by TCP          |
| START_SYNC       | 8             | 0xFFFFFFFFFFFFFF        |
| Message length   | 4             | multiple of 4           |
| Message          | multiple of 4 | see message definitions |
| Message Checksum | 4             | see checksum definition |

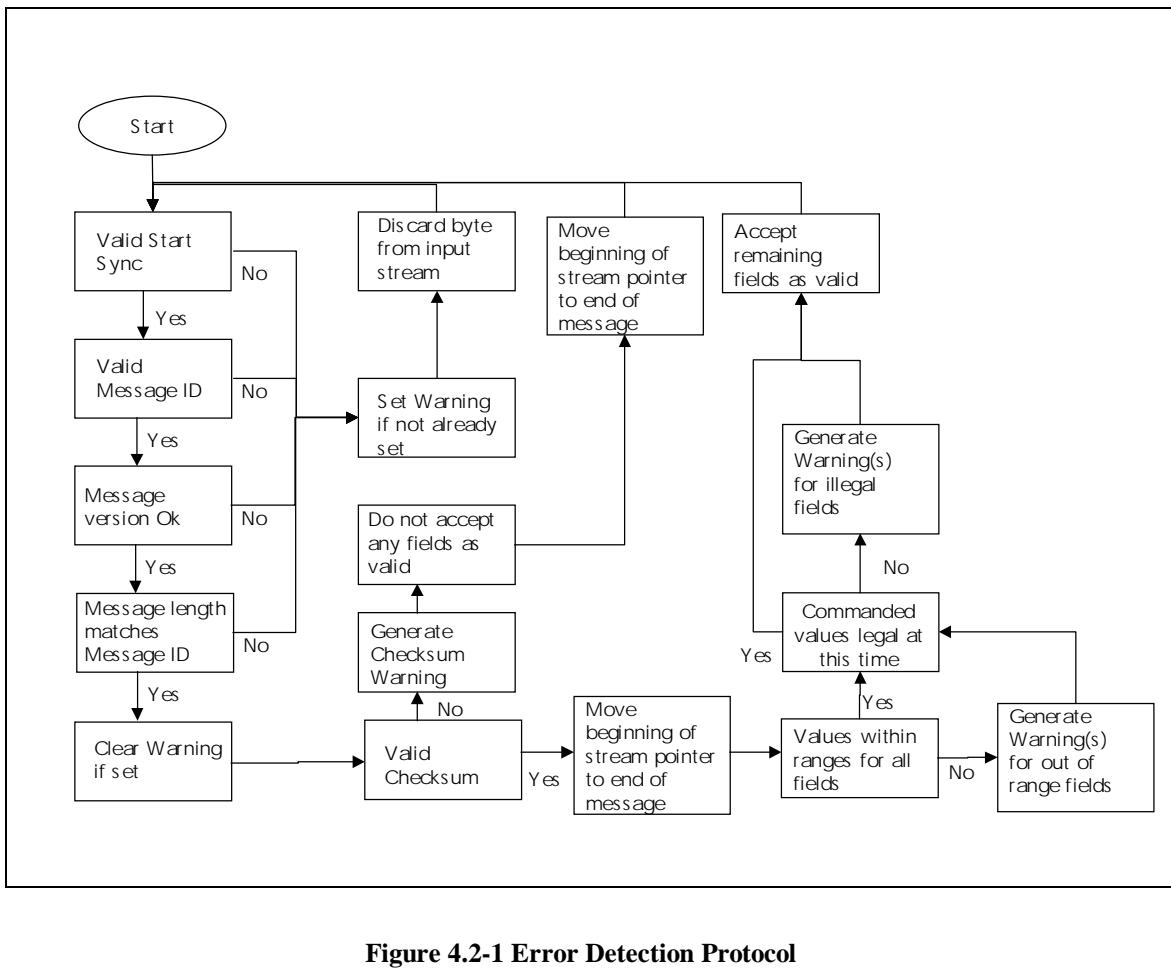
Table 4.2.3-1 Message Structure

The Checksum is defined as a byte-wise unsigned sum over the Message length and Message fields in to a 32 bit Integer. For the purposes of generating the Checksum, each 4-byte word will be interpreted as 4 Unsigned Characters. A functional algorithm for computing the Checksum is given below.

```
checksum = 0;
for (i=0; i<message_length; i++)
checksum += (int)*(((unsigned char *)message) + i);
for (i=0; i<4; i++)
    checksum += (int)*(((unsigned char *)message length) + i);
```

#### **4.2.4 Message Protocol Error Handling**

The algorithm which shall be used for receiving messages and checking their validity is depicted in the diagram below.



**Figure 4.2-1 Error Detection Protocol**

#### 4.2.4.1 Start Sync Errors

If a start sync error is detected, the receiver shall discard one byte from the stream and check for a start sync. If the DCM detects a start sync error, it shall also generate an AV Warning Message with a new warning with the alert ID set to 1001XXX where XXX is the message ID padded with leading zeros of the last successfully received message with the alert level set to 2. Once a valid message is received following the error, the warning shall be cleared with another AV Warning Message with the same alert ID.

#### 4.2.4.2 Outside Range Errors

If the DCM receives a value from the AV which is outside of the valid ranges allowed by the AV Standard interface, the DCM shall fill that field with either  $2^{31}-1$  if the field is an Integer or an IEEE positive infinity if the field is a Double. The DCM shall then generate an AV Warning Message with a new warning with the alert ID set to 1002XXX where XXX is the message ID padded with leading zeros of the message with the out of range field with the alert level

set to 2. Once a message is sent from the DCM to the TCS RTP with a valid value in the offending field, the warning shall be cleared with another AV Warning Message with the same alert ID.

#### **4.2.4.3 Checksum Errors**

If a message is received with an invalid check sum, the receiver shall discard the entire message. If the DCM is the receiver of the invalid check sum, it shall generate an AV Warning Message with a new warning with the alert ID set to 1000XXX where XXX is the message ID padded with leading zeros of the offending message and the alert level set to 2. Once a valid message is received following the error, the warning shall be cleared with another AV Warning Message

#### **4.2.4.4 Illegal Command Field Errors**

If the DCM receives a message from the TCS RTP which contains a field with an illegal value, the DCM shall ignore the offending field and treat the rest of the fields in the message as good. The DCM shall generate a DCM Protocol Error Message (message ID 37) with a textual description of the error.

### **4.2.5 Messages**

The message formats used to transfer the command and telemetry data are defined in the sections that follow. Fields within messages shall be in the order specified in this document. The combination of field position and field data type fully specifies the position of the field within the message. All fields within a message shall be contiguous and there shall be no padding between subsequent fields. Care should be taken in implementing these messages to prevent compilers from including padding to perform boundary alignment. Implementations may convert the message definitions as XDR source code and compile the source with RPCGEN to automate the generation of the interface management software, but this is not required. Note that RPCGEN is being used to implement standard Berkley Sockets not the RPC protocol.

All references to Global Positioning System (GPS) time assume the correction factors embedded in the GPS timing signals to correct to Greenwich Mean Time (GMT) have been applied.

All references to position and orientation, including but not limited to latitude, longitude, altitude, roll, pitch, and heading, are referenced to the World Geodetic System 84 (WGS 84) datum.

Below is a summary of the messages transferred across the AV Standard Interface.

## DCM to TCS Messages

| <b>Message Name</b>                                  | <b>Message ID</b> |
|--|-------------------|
| AV Position Status Message                           | 1                 |
| AV INS Status Message                                | 2                 |
| AV GPS Status Message                                | 3                 |
| AV EOIR Status Message                               | 4                 |
| AV Line of Sight Ground Data Terminal Status Message | 5                 |
| AV Line of Sight Air Data Terminal Status Message    | 6                 |
| AV Piston Engine Status Message                      | 7                 |
| AV Fuel Status Message                               | 8                 |
| AV Electrical System Status Message                  | 9                 |
| AV Analog Video System Status Message                | 10                |
| AV Lights and Landing Gear Status Message            | 11                |
| AV IFF Status Message                                | 12                |
| AV SAR Status Message                                | 15                |
| AV Warning Message                                   | 19                |
| DCM Protocol Error Message                           | 37                |
| DCM Mission Load Acknowledge                         | 38                |
| AV Servo Status Message                              | 39                |

Table 4.2.5-1 DCM to TCS Messages

## TCS to DCM Messages

| <b>Message Name</b>                             | <b>Message ID</b> |
|---|-------------------|
| AV Flight Mode Command Message                  | 13                |
| AV Flight Envelope Command Message              | 14                |
| AV Lights Command Message                       | 24                |
| TCS Position Uplink Message                     | 35                |
| TCS Environmental Data Uplink Message           | 27                |
| EOIR Command Message                            | 28                |
| AV Analog Video Command Message                 | 22                |
| AV Waypoint Begin Message                       | 33                |
| AV Piston Engine Command Message                | 25                |
| AV IFF Command Message                          | 26                |
| AV Fuel System Command Message                  | 23                |
| Ground Line of Sight Datalink Command Message   | 29                |
| Airborne Line of Sight Datalink Command Message | 30                |
| Airborne SATCOM Datalink Command Message        | 31                |

Table 4.2.5-2 TCS to DCM Messages

#### 4.2.5.1 DCM to TCS Messages

The messages contained in 4.2.4.1 are transferred from the DCM to the TCS.

##### 4.2.5.1.1 AV Position Status Message

The length of the AV Position Status Message is 252 bytes.

| AV Position Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments   |
|----------------------------------|---|-----------|------------|----------------------------|--|
| 1                                | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 1                          |  |
| 2                                | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |  |
| 3                                | <b>AV_Type</b><br>Identifies the Air Vehicle which TCS is flying.                       | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                                | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length field making the total field length 16 bytes. |
| 5                                | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                  | Integer   | None       | 1 <= x <= 65535            |  |

| AV Position Status<br>Message Field | Data Element Name &<br>Description  | Data<br>Type | Data Units            | Range Values           | Comments  |
|-------------------------------------|---|--------------|-----------------------|------------------------|---|
| 6                                   | <b>AV_Current_Nav_Altitude_Source</b><br>Identifies the Air Vehicle's current primary altitude source for navigation.   | Integer      | None                  | 1 <= x <= 4            | 1 = Barometer<br>2 = GPS<br>3 = INS<br>4 = Radar Altimeter                              |
| 7                                   | <b>AV_Altitude</b><br>If AV_Current_Nav_Altitude_Source = 4,<br>Identifies the Air Vehicles altitude above ground.<br>Else,<br>Identifies the Air Vehicles altitude above mean sea level currently used for navigation. | Double       | Feet                  | -2,000 <= x <= 100,000 |   |
| 8                                   | <b>AV_Climb_Rate</b><br>Indicates the vertical airspeed of the Air Vehicle currently used for navigation  | Double       | Feet<br>Per<br>Minute | -5000 <= x <= 5000     |   |
| 9                                   | <b>AV_Current_Nav_Position_Source</b><br>Identifies the Air Vehicle's current primary position source for navigation.   | Integer      | None                  | 1 <= x <= 4            | 1 = INS<br>2 = GPS<br>3 = Dead Reckoning<br>4 = GDT Tracking                            |
| 10                                  | <b>AV_Latitude</b><br>Identifies the Air Vehicle's latitude currently used for navigation   | Double       | Degrees               | -90 <= x <= 90         | Positive value indicates North latitude.  |
| 11                                  | <b>AV_Longitude</b><br>Identifies the Air Vehicle's longitude currently used for navigation   | Double       | Degrees               | -180 < x <= 180        | Positive value indicates East longitude.  |
| 12                                  | <b>AV_NAV_Orientation_Source</b><br>Identifies the Air Vehicle's current primary source for autopilot control   | Integer      | None                  | 1 <= x <= 4            | 1 = INS<br>2 = GPS<br>3 = Gyro<br>4 = Magnetometer                                      |
| 13                                  | <b>AV_Roll</b><br>Indicates the current attitude of the Air Vehicle in the roll axis with respect to local level plane.   | Double       | Degrees               | -180 <= x <= 180       | Positive values indicate starboard wing down. This field is not valid for magnetometer. |

| AV Position Status Message Field | Data Element Name & Description   | Data Type | Data Units         | Range Values     | Comments  |
|----------------------------------|---|-----------|--------------------|------------------|---|
| 14                               | <b>AV_Pitch</b><br>Indicates the current attitude of the Air Vehicle in the pitch axis with respect to local level plane. | Double    | Degrees            | -90 <= x <= 90   | Positive values indicate nose up. This field is not valid for magnetometer.   |
| 15                               | <b>AV_Heading</b><br>Indicates the Air Vehicle's heading with respect to true north.                                      | Double    | Degrees            | 0 <= x < 360     | This does not necessarily indicate the current ground track.  |
| 16                               | <b>AV_Pitch_Rate</b><br>Indicates the current rate of change in attitude of the Air Vehicle in the pitch axis.            | Double    | Degrees Per Second | -90 <= x <= 90   | Positive value indicates increasing AV_Pitch.   |
| 17                               | <b>AV_Roll_Rate</b><br>Indicates the current rate of change in attitude of the Air Vehicle in the roll axis.              | Double    | Degrees Per Second | -180 <= x <= 180 | Positive value indicates increasing AV_Roll.  |
| 18                               | <b>AV_Yaw_Rate</b><br>Indicates the rate of change of the Air Vehicle's heading.  | Double    | Degrees Per Second | -90 <= x <= 90   | Positive value indicates increasing AV_Heading.   |
| 19                               | <b>AV_Angle_Of_Attack_1</b><br>Indicates the Air Vehicle's current angle of attack as measured by sensor 1.               | Double    | Degrees            | -90 <= x <= 90   | See AV Specific appendices for mapping of values to sensors on the Air Vehicle.   |
| 20                               | <b>AV_Angle_Of_Attack_2</b><br>Indicates the Air Vehicle's current angle of attack as measured by sensor 2.               | Double    | Degrees            | -90 <= x <= 90   | See AV Specific appendices for mapping of values to sensors on the Air Vehicle.   |
| 21                               | <b>AV_AOA_Sensor_Active</b><br>Indicates which Angle of Attack sensor is currently being used by the autopilot.           | Integer   | None               | 1 <= x <= 2      | 1 = AOA sensor 1 is currently being used by the autopilot.<br>2 = AOA sensor 2 is currently being used by the autopilot.<br>See AV Specific appendices for mapping of values to sensors on the Air Vehicle. |

| AV Position Status<br>Message Field | Data Element Name &<br>Description   | Data<br>Type | Data Units  | Range Values           | Comments   |
|-------------------------------------|--|--------------|-------------|------------------------|--|
| 22                                  | <b>AV_GPS_Time_Week</b><br>Indicates the GPS time in weeks.  | Integer      | Weeks       | 0 <= x < 1024          | This value will roll over to 0 in August 1999.                       |
| 23                                  | <b>AV_GPS_Time_Second</b><br>Indicates the GPS time in seconds.                                      | Integer      | Seconds     | 0 <= x < 604800        |  |
| 24                                  | <b>AV_GPS_Time_Ns</b><br>Indicates the GPS time in nanoseconds.                                      | Integer      | Nanoseconds | 0 <= x < 1000000000    |  |
| 25                                  | <b>AV_Baro_Altitude</b><br>Identifies the Air Vehicle barometric altitude.                           | Double       | Feet        | -2,000 <= x <= 100,000 |  |
| 26                                  | <b>AV_Radar_Altitude</b><br>Identifies the Air Vehicle altitude from the radar altimeter.            | Double       | Feet        | -2,000 <= x <= 100,000 |  |
| 27                                  | <b>AV_Magnetometer_Heading</b><br>Identifies the Air Vehicle heading from the magnetometer.          | Double       | Degrees     | 0 <= x < 360           |  |
| 28                                  | <b>AV_Ground_Track</b><br>Provides the UAV course with respect to the ground track                   | Double       | Degrees     | 0 <= x < 360           |  |
| 29                                  | <b>AV_Ground_Speed</b><br>Indicates the calculated UAV ground speed.                                 | Double       | Knots       | 0 <= x <= 800          |  |
| 30                                  | <b>AV_Airspeed_1</b><br>Represents the Indicated airspeed of the Air Vehicle from airspeed sensor 1. | Double       | Knots       | 0 <= x <= 600          | See Air Vehicle specific appendices for mapping to specific sensors. |
| 31                                  | <b>AV_Airspeed_2</b><br>Represents the Indicated airspeed of the Air Vehicle from airspeed sensor 2. | Double       | Knots       | 0 <= x <= 600          | See Air Vehicle specific appendices for mapping to specific sensors. |

| AV Position Status<br>Message Field | Data Element Name &<br>Description   | Data<br>Type | Data Units            | Range Values     | Comments   |
|-------------------------------------|--|--------------|-----------------------|------------------|--|
| 32                                  | <b>AV_Airspeed_Sensor_Active</b><br>Indicates which airspeed sensor is currently being used by the autopilot.              | Integer      | None                  | 1 <= x <= 2      | See Air Vehicle specific appendices for mapping to specific sensors.   |
| 33                                  | <b>AV_Measured_Wind_Heading</b><br>Indicates the wind heading measured by the Air Vehicle referenced to true north.        | Double       | Degrees               | 0 <= x < 360     | If AV_Type=1, Derived from AV airspeed, AV heading, and GPS velocity.  |
| 34                                  | <b>AV_Measured_Wind_Speed</b><br>Indicates the wind speed measured by the Air Vehicle.                                     | Double       | Knots                 | 0 <= x <= 200    | If AV_Type=1, Derived from AV airspeed, AV heading, and GPS velocity   |
| 35                                  | <b>AV_Nav_Mode</b><br>Identifies the Air Vehicle navigation mode.  | Integer      | None                  | 1 <= x <= 7      | 1 = Follow waypoints in current mission.<br>2 = Follow heading, altitude, and airspeed hold values.<br>3 = Fly to point using best speed.<br>4 = Fly to point using most fuel efficient speed.<br>5 = Fly to point to arrive at specified time.<br>6 = Loiter at point.<br>7 = Direct flight control by DCM. |
| 36                                  | <b>AV_Next_Waypoint</b><br>Identifies the next waypoint in the mission the plan the air vehicle is flying towards.         | Integer      | None                  | 0 <= x <= 65535  | 0 = Not currently in waypoint flight mode.   |
| 37                                  | <b>AV_TTG_Next_Waypoint</b><br>Identifies the estimated time to go to the next waypoint the air vehicle is flying towards. | Integer      | Seconds               | 0 <= x <= 100000 |  |
| 38                                  | <b>AV_Air_Temperature</b><br>Indicates the air temperature measured by the Air Vehicle.                                    | Double       | Degrees<br>Fahrenheit | -200 <= x <= 200 |  |

#### 4.2.5.1.2 AV INS Status Message

The length of the AV INS Status Message is 192 bytes.

| AV INS Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments   |
|-----------------------------|---|-----------|------------|----------------------------|--|
| 1                           | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 2                          |  |
| 2                           | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |  |
| 3                           | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                           | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4 byte string length element making the total field length 16 bytes. |
| 5                           | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                  | Integer   | None       | 1 <= x <= 65535            |  |
| 6                           | <b>AV_INS_Er_NS</b><br>Identifies the Air Vehicle's INS north south position error.     | Double    | Feet       | -2000 <= x <= 2000         |  |
| 7                           | <b>AV_INS_Er_EW</b><br>Identifies the Air Vehicle's INS east west position error        | Double    | Feet       | -2000 <= x <= 2000         |  |

| AV INS Status Message Field | Data Element Name & Description  | Data Type | Data Units                   | Range Values           | Comments                                  |
|-----------------------------|--|-----------|------------------------------|------------------------|---|
| 8                           | <b>AV_INS_Er_Alt</b><br>Identifies the Air Vehicle's INS altitude position error.                                  | Double    | Feet                         | -2000 <= x <= 2000     |   |
| 9                           | <b>AV_INS_Mode</b><br>Identifies the Air Vehicle's INS mode.   | Integer   | None                         | 0 <= x <= 100          | See AV Specific appendices for values.    |
| 10                          | <b>AV_INS_Alt</b><br>Identifies the Air Vehicle altitude above mean sea level from the internal navigation system. | Double    | Feet                         | -2,000 <= x <= 100,000 | Referenced to the WGS 84 datum.           |
| 11                          | <b>AV_INS_Lat</b><br>Identifies the Air Vehicle latitude from the internal navigation system.                      | Double    | Degrees                      | -90 <= x <= 90         | Referenced to the WGS 84 datum.           |
| 12                          | <b>AV_INS_Lon</b><br>Identifies the Air Vehicle longitude from the inertial navigation system.                     | Double    | Degrees                      | -180 < x <= 180        | Referenced to the WGS 84 datum.           |
| 13                          | <b>AV_INS_East_Velocity</b><br>Indicates the East component of the Air Vehicle's velocity.                         | Double    | Feet Per Second              | -2000 <= x <= 2000     |   |
| 14                          | <b>AV_INS_North_Velocity</b><br>Indicates the North component of the Air Vehicle's velocity.                       | Double    | Feet Per Second              | -2000 <= x <= 2000     |   |
| 15                          | <b>AV_INS_Altitude_Velocity</b><br>Indicates the altitude component of the Air Vehicle's velocity.                 | Double    | Feet Per Second              | -1000 <= x <= 1000     | Positive value indicates gaining altitude |
| 16                          | <b>AV_INS_East_Acceleration</b><br>Indicates the East component of the Air Vehicle's acceleration.                 | Double    | Feet Per Second <sup>2</sup> | -300 <= x <= 300       |   |
| 17                          | <b>AV_INS_North_Acceleration</b><br>Indicates the North component of the Air Vehicle's acceleration.               | Double    | Feet Per Second <sup>2</sup> | -300 <= x <= 300       |   |

| AV INS Status Message Field | Data Element Name & Description  | Data Type | Data Units                   | Range Values     | Comments  |
|-----------------------------|--|-----------|------------------------------|------------------|---|
| 18                          | <b>AV_INS_Altitude_Acceleration</b><br>Indicates the Altitude component of the Air Vehicle's acceleration.   | Double    | Feet Per Second <sup>2</sup> | -300 <= x <= 300 |   |
| 19                          | <b>AV_INS_Pitch</b><br>Indicates the current attitude of the Air Vehicle in the pitch axis with respect to local level plane reported from the inertial navigation system. | Double    | Degrees                      | -90 < x <= 90    | Positive value indicates nose up.   |
| 20                          | <b>AV_INS_Roll</b><br>Indicates the current attitude of the Air Vehicle in the roll axis with respect to local level plane reported from the inertial navigation system.   | Double    | Degrees                      | -180 <= x <= 180 | Positive value indicates starboard wing down.                                       |
| 21                          | <b>AV_INS_Heading</b><br>Indicates the Air Vehicle's heading with respect to true north reported from the inertial navigation system.                                      | Double    | Degrees                      | 0 <= x < 360     | Heading is referenced to true North and does not necessarily indicate ground track. |
| 22                          | <b>AV_INS_Pitch_Rate</b><br>Indicates the current rate of change in attitude of the Air Vehicle in the pitch axis.   | Double    | Degrees Per Second           | -90 <= x <= 90   | Positive value indicates increasing AV_INS_Pitch.                                   |
| 23                          | <b>AV_INS_Roll_Rate</b><br>Indicates the current rate of change in attitude of the Air Vehicle in the roll axis.   | Double    | Degrees Per Second           | -180 <= x <= 180 | Positive value indicates increasing AV_INS_Roll.                                    |
| 24                          | <b>AV_INS_Yaw_Rate</b><br>Indicates the rate of change of the Air Vehicle's heading.   | Double    | Degrees Per Second           | -90 <= x <= 90   | Positive value indicates increasing AV_INS_Heading.                                 |
| 25                          | <b>AV_INS_Time_Week</b><br>Indicates the current time reported by the Air Vehicle's INS system.  | Integer   | Weeks                        | 0 <= x <= 1024   | Time is in standard GPS time format. This field will roll over to 0 in August 1999. |
| 26                          | <b>AV_INS_Time_Second</b><br>Indicates the current time reported by the Air Vehicle's INS system.  | Integer   | Seconds                      | 0 <= x <= 604800 | Time is in standard GPS time format.  |

| AV INS Status Message Field | Data Element Name & Description   | Data Type | Data Units  | Range Values         | Comments |
|-----------------------------|---|-----------|-------------|----------------------|----------|
| 27                          | <b>AV_INS_Time_Ns</b><br>Indicates the current time reported by the Air Vehicle's INS system. | Integer   | Nanoseconds | 0 <= x <= 1000000000 |          |

#### 4.2.5.1.3 AV GPS Status Message

The length of the AV GPS Status Message is 264 bytes.

| AV GPS Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments   |
|-----------------------------|---|-----------|------------|----------------------------|--|
| 1                           | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 3                          |  |
| 2                           | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |  |
| 3                           | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                           | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |

| AV GPS Status Message Field | Data Element Name & Description   | Data Type | Data Units      | Range Values           | Comments  |
|-----------------------------|---|-----------|-----------------|------------------------|---|
| 5                           | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                                | Integer   | None            | 1 <= x <= 65535        |   |
| 6                           | <b>AV_GPS_Time_Week</b><br>Indicates the GPS time is weeks.   | Integer   | Weeks           | 0 <= x < 1024          | This value will roll over to 0 in August 1999.  |
| 7                           | <b>AV_GPS_Time_Second</b><br>Indicates the GPS time in seconds.                                       | Integer   | Seconds         | 0 <= x < 604800        |   |
| 8                           | <b>AV_GPS_Time_Ns</b><br>Indicates the GPS time in nanoseconds  | Integer   | Nanoseconds     | 0 <= x < 1000000000    |   |
| 9                           | <b>AV_GPS_Mode</b><br>Indicates the current operating mode of the GPS.                                | Integer   | None            | 1 <= x <= 4            | 1 = Standard Positioning<br>2 = Standard Positioning with Differential Correction<br>3 = Precise Positioning<br>4 = Precise Positioning with attitude determination |
| 10                          | <b>AV_GPS_Alt</b><br>Identifies the Air Vehicles altitude above mean sea level from the GPS receiver. | Double    | Feet            | -2,000 <= x <= 100,000 |   |
| 11                          | <b>AV_GPS_Climb_Rate</b><br>Indicates the Air Vehicle's climb rate from the GPS receiver.             | Double    | Feet Per Minute | -5000 <= x <= 5000     |   |
| 12                          | <b>AV_GPS_Lat</b><br>Identifies the Air Vehicles latitude from the GPS receiver.                      | Double    | Degrees         | -90 <= x <= 90         |   |
| 13                          | <b>AV_GPS_Lon</b><br>Identifies the Air Vehicles longitude from the GPS receiver.                     | Double    | Degrees         | -180 < x <= 180        |   |

| AV GPS Status Message Field | Data Element Name & Description  | Data Type | Data Units         | Range Values     | Comments   |
|-----------------------------|--|-----------|--------------------|------------------|--|
| 14                          | <b>AV_GPS_Roll</b><br>Indicates the current attitude of the Air Vehicle in the roll axis with respect to local level plane reported from the receiver.       | Double    | Degrees            | -180 <= x <= 180 | Positive value indicates starboard wing down. This field valid only if AV_GPS_Mode = 4.  |
| 15                          | <b>AV_GPS_Pitch</b><br>Indicates the current attitude of the Air Vehicle in the pitch axis with respect to local level plane reported from the GPS receiver. | Double    | Degrees            | -90 < x <= 90    | Positive value indicates nose up. This field valid only if AV_GPS_Mode = 4.  |
| 16                          | <b>AV_GPS_Heading</b><br>Indicates the Air Vehicle's heading with respect to true north reported from the GPS receiver.                                      | Double    | Degrees            | 0 <= x < 360     | This field is valid only for GPS receivers that can determine heading instantaneously, not from subsequent position measurements. This field valid only if AV_GPS_Mode = 4. This does not necessarily indicate the current ground track. |
| 17                          | <b>AV_GPS_Ground_Track</b><br>Identifies the ground track of the Air Vehicle with respect to true north.   | Double    | Degrees            | 0 <= x <= 360    |  |
| 18                          | <b>AV_GPS_Ground_Speed</b><br>Indicates the ground speed of the Air Vehicle.   | Double    | Knots              | 0 <= x <= 800    |  |
| 19                          | <b>AV_GPS_Pitch_Rate</b><br>Indicates the current rate of change in attitude of the Air Vehicle in the pitch axis.   | Double    | Degrees Per Second | -90 <= x <= 90   | Positive value indicates increasing AV_GPS_Pitch.  |
| 20                          | <b>AV_GPS_Roll_Rate</b><br>Indicates the current rate of change in attitude of the Air Vehicle in the roll axis.   | Double    | Degrees Per Second | -180 <= x <= 180 | Positive value indicates increasing AV_GPS_Roll.   |
| 21                          | <b>AV_GPS_Yaw_Rate</b><br>Indicates the rate of change of the Air Vehicle's heading.   | Double    | Degrees Per Second | -90 <= x <= 90   | Positive value indicates increasing AV_GPS_Heading.  |

| AV GPS Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values       | Comments  |
|-----------------------------|--|-----------|------------|--------------------|---|
| 22                          | <b>AV_GPS_CEP</b><br>Specifies the estimated error in the GPS horizontal position.                                       | Double    | Feet       | 0 <= x <= 2000     | Estimated horizontal Position Error   |
| 23                          | <b>AV_GPS_Alt_Err</b><br>Specifies the estimated error in the GPS vertical position.                                     | Double    | Feet       | -2000 <= x <= 2000 | Estimated error for GPS altitude above MSL  |
| 24                          | <b>AV_GPS_Stat</b><br>Identifies the status of the Air Vehicle's GPS receiver.   | Integer   | None       | 0 <= x <= 6        | 0 = Off<br>1 = On, becoming ready<br>2 = On, internal error detected<br>3 = Acquiring satellites for first fix<br>4 = 2D positioning, good signal<br>5 = 2D positioning, weak signal<br>6 = 3D positioning, good signal |
| 25                          | <b>AV_GPS_Satellites_In_Fix</b><br>Indicates the number of satellites currently being used in the GPS position solution. | Integer   | None       | 0 <= x <= 12       |   |
| 26                          | <b>AV_GPS_Sat1 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number one.                                      | Integer   | None       | 0 <= x < 1024      | 0 = Not received  |
| 27                          | <b>AV_GPS_Sat2 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number two.                                      | Integer   | None       | 0 <= x < 1024      | 0 = Not received  |
| 28                          | <b>AV_GPS_Sat3 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number three.                                    | Integer   | None       | 0 <= x < 1024      | 0 = Not received  |
| 29                          | <b>AV_GPS_Sat4 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number four.                                     | Integer   | None       | 0 <= x < 1024      | 0 = Not received  |
| 30                          | <b>AV_GPS_Sat5 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number five.                                     | Integer   | None       | 0 <= x < 1024      | 0 = Not received  |

| AV GPS Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values  | Comments                                    |
|-----------------------------|---|-----------|------------|---------------|---|
| 31                          | <b>AV_GPS_Sat6 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number six.               | Integer   | None       | 0 <= x < 1024 | 0 = Not received                            |
| 32                          | <b>AV_GPS_Sat7 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number seven.             | Integer   | None       | 0 <= x < 1024 | 0 = Not received                            |
| 33                          | <b>AV_GPS_Sat8 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number eight.             | Integer   | None       | 0 <= x < 1024 | 0 = Not received                            |
| 34                          | <b>AV_GPS_Sat9 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number nine.              | Integer   | None       | 0 <= x < 1024 | 0 = Not received                            |
| 35                          | <b>AV_GPS_Sat10 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number ten.              | Integer   | None       | 0 <= x < 1024 | 0 = Not received                            |
| 36                          | <b>AV_GPS_Sat11 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number eleven.           | Integer   | None       | 0 <= x < 1024 | 0 = Not received                            |
| 37                          | <b>AV_GPS_Sat12 SVN_ID</b><br>Identifies the Air Vehicle's GPS satellite number twelve.           | Integer   | None       | 0 <= x < 1024 | 0 = Not received                            |
| 38                          | <b>AV_GPS_Sig_Str_1</b><br>Indentures the Air Vehicle's GPS receiver satellite 1 signal strength. | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 39                          | <b>AV_GPS_Sig_Str_2</b><br>Identifies the Air Vehicle's GPS receiver satellite 2 signal strength. | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 40                          | <b>AV_GPS_Sig_Str_3</b><br>Identifies the Air Vehicle's GPS receiver satellite 3 signal strength. | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 41                          | <b>AV_GPS_Sig_Str_4</b><br>Identifies the Air Vehicle's GPS receiver satellite 4 signal strength. | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |

| AV GPS Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values  | Comments                                    |
|-----------------------------|---|-----------|------------|---------------|---|
| 42                          | <b>AV_GPS_Sig_Str_5</b><br>Identifies the Air Vehicle's GPS receiver satellite 5 signal strength.   | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 43                          | <b>AV_GPS_Sig_Str_6</b><br>Identifies the Air Vehicle's GPS receiver satellite 6 signal strength.   | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 44                          | <b>AV_GPS_Sig_Str_7</b><br>Identifies the Air Vehicle's GPS receiver satellite 7 signal strength.   | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 45                          | <b>AV_GPS_Sig_Str_8</b><br>Identifies the Air Vehicle's GPS receiver satellite 8 signal strength.   | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 46                          | <b>AV_GPS_Sig_Str_9</b><br>Identifies the Air Vehicle's GPS receiver satellite 9 signal strength.   | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 47                          | <b>AV_GPS_Sig_Str_10</b><br>Identifies the Air Vehicle's GPS receiver satellite 10 signal strength. | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 48                          | <b>AV_GPS_Sig_Str_11</b><br>Identifies the Air Vehicle's GPS receiver satellite 11 signal strength. | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |
| 49                          | <b>AV_GPS_Sig_Str_12</b><br>Identifies the Air Vehicle's GPS receiver satellite 12 signal strength. | Integer   | Percent    | 0 <= x <= 100 | 0 = No Signal<br>100 = Full Signal Strength |

#### 4.2.5.1.4 AV EOIR Status Message

The length of the AV EOIR Status Message is 212 bytes.

| AV EOIR Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments   |
|------------------------------|---|-----------|------------|----------------------------|--|
| 1                            | <b>Message_ID</b><br>Identifies the message being transmitted.                                      | Integer   | None       | 4                          |  |
| 2                            | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.             | Integer   | None       | See AV Specific Appendices |  |
| 3                            | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                    | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                            | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                        | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                            | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                              | Integer   | None       | 1 <= x <= 65535            |  |
| 6                            | <b>PL_ID</b><br>Indicates which EO/IR payload is reporting in this message                          | Integer   | None       | See AV Specific Appendices | See AV Specific Appendices   |
| 7                            | <b>PL_Active_Sensor</b><br>Identifies the Air Vehicle's active sensor.                              | Integer   | None       | 0 <= x <= 2                | 0 = None<br>1 = Electro-optical<br>2 = Infrared  |
| 8                            | <b>EO_Payload_Camera_Selected</b><br>Identifies which EO camera in the payload is currently active. | Integer   | None       | 0 <= x <= 3                | See AV Specific Appendix for values.   |

| AV EOIR Status Message Field | Data Element Name & Description  | Data Type | Data Units         | Range Values    | Comments  |
|------------------------------|--|-----------|--------------------|-----------------|---|
| 9                            | <b>PL_Active_Sensor_Status</b>   | Integer   | None               | 0 <= x <= 5     | 0 = Off, Stowed<br>1 = Off, Not Stowed<br>2 = On, Becoming Ready<br>3 = On, Calibrating<br>4 = On, Ready<br>5 = On, Operating |
| 10                           | <b>PL_Pointing_Mode</b><br>Indicates the current method being used to command the payload's pointing position. | Integer   | None               | 0 <= x <= 4     | 0 = Latitude, Longitude<br>1 = Azimuth, Elevation<br>2 = Auto track<br>3 = Waypoint Control<br>4 = Rate Control               |
| 11                           | <b>PL_Pointer_Lat</b><br>Indicates the commanded center point latitude of the EO/IR payload fixing point.      | Double    | Degrees            | -90 <= x <= 90  | Positive value indicates North latitude.  |
| 12                           | <b>PL_Pointer_Lon</b><br>Indicates the commanded center point longitude of the EO/IR payload fixing point.     | Double    | Degrees            | -180 < x <= 180 | Positive value indicates East longitude.  |
| 13                           | <b>PL_Depression_Angle</b><br>Specifies the pointing depression of the EO/IR payload referenced to the AV.     | Double    | Degrees            | -90 <= x <= 120 | In reference to the Air Vehicle.<br>Positive depression indicates payload is pointing down.                                   |
| 14                           | <b>PL_Azimuth_Angle</b><br>Specifies the pointing azimuth of EO/IR payload referenced to the AV.               | Double    | Degrees            | 0 <= x < 360    | In reference to Air Vehicle heading.  |
| 15                           | <b>PL_Depression_Rate</b><br>Identifies the payload depression angle change rate.                              | Double    | Degrees Per Second | -60 <= x <= 60  |   |
| 16                           | <b>PL_Azimuth_Rate</b><br>Identifies the payload azimuth change rate.  | Double    | Degrees Per Second | -90 <= x <= 90  |   |
| 17                           | <b>PL_LOS_Range_to_Target</b><br>Identifies the payload range to the center of field of view.                  | Double    | Nautical Miles     | 0 <= x <= 200   |   |

| AV EOIR Status Message Field | Data Element Name & Description  | Data Type | Data Units     | Range Values    | Comments                       |
|------------------------------|--|-----------|----------------|-----------------|--------------------------------|
| 18                           | <b>PL_Ground_Range_to_Target</b><br>Identifies the range to center of field of view from Air Vehicle projected position on the ground. | Double    | Nautical Miles | 0 <= x <= 200   |                                |
| 19                           | <b>PL_Focal_Length</b><br>Identifies the focal length of the active sensor.  | Double    | Millimeters    | 1 <= x <= 5000  |                                |
| 20                           | <b>PL_FOV_Horizontal</b><br>Identifies the horizontal field of view of the active sensor.  | Double    | Degrees        | 0 <= x <= 90    |                                |
| 21                           | <b>PL_FOV_Vertical</b><br>Identifies the vertical field of view of the active sensor.  | Double    | Degrees        | 0 <= x <= 90    |                                |
| 22                           | <b>PL_IR_Polarity</b><br>Identifies the infrared payload polarity.   | Integer   | None           | 0 <= x <= 1     | 0 = White hot<br>1 = Black hot |
| 23                           | <b>PL_IR_Gain</b><br>Indicates the gain setting for the IR payload.  | Double    | None           | 0 <= x <= 100   |                                |
| 24                           | <b>PL_Image_Ang_to_North</b><br>Angle in degrees from the first row of the image to true north.  | Double    | Degrees        | -180 < x <= 180 | Clockwise is positive.         |
| 25                           | <b>PL_Image_Datum</b><br>Identifies the map datum used to derive the target coordinate.  | Integer   | None           | 0               | 0 = WGS 84                     |

| AV EOIR Status Message Field | Data Element Name & Description   | Data Type | Data Units  | Range Values        | Comments   |
|------------------------------|---|-----------|-------------|---------------------|--|
| 26                           | <b>PL_Image_Category</b><br>Identifies the specific category of imagery.  | Integer   | None        | 0 <= x <= 9         | 0 = Slide Looking Radar<br>1 = Thermal Infrared<br>2 = Forward Looking Infrared<br>3 = Radar<br>4 = Electro-Optical<br>5 = Optical<br>6 = High Resolution Radar<br>7 = Hyperspectral<br>8 = Color Frame Photography<br>9 = Black/White Frame Photography |
| 27                           | <b>PL_Image_Obliquity_Angle</b><br>Indicates the obliquity angle of image expressed in degrees.   | Double    | Degrees     | 0 <= x <= 90        |  |
| 28                           | <b>PL_Center_Point_Accuracy</b><br>Identifies the accuracy of center point positional data provided. Expressed as error standard deviation in meters. | Double    | Meters      | 0 <= x <= 2000      |  |
| 29                           | <b>PL_Center_Point_Lat</b><br>Identifies the center point target latitude.  | Double    | Degrees     | -90 <= x <= 90      |  |
| 30                           | <b>PL_Center_Point_Lon</b><br>Identifies the center point target longitude.   | Double    | Degrees     | -180 < x <= 180     |  |
| 31                           | <b>PL_Image_Collection_Time_Week</b><br>Indicates the date and time an image was captured by a collector expressed in standard GPS time format.       | Integer   | Weeks       | 0 <= x < 1024       | This is the week field of the current time in standard GPS data format.  |
| 32                           | <b>PL_Image_Collection_Time_Second</b><br>Indicates the date and time an image was captured by a collector expressed in standard GPS time format.     | Integer   | Seconds     | 0 <= x < 604800     | This is the second field of the current time in standard GPS data format.  |
| 33                           | <b>PL_Image_Collection_Time_Ns</b><br>Indicates the date and time an image was captured by a collector in nanoseconds.                                | Integer   | Nanoseconds | 0 <= x < 1000000000 |  |

#### 4.2.5.1.5 AV Line of Sight Ground Data Terminal Status Message

This message is 200 bytes long.

| AV Line of Sight<br>Ground Data<br>Terminal Status<br>Message Field | Data Element Name &<br>Description  | Data<br>Type | Data Units | Range Values               | Comments   |
|---|---|--------------|------------|----------------------------|--|
| 1   | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer      | None       | 5                          |  |
| 2   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer      | None       | See AV Specific Appendices |  |
| 3   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer      | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String       | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                  | Integer      | None       | 1 <= x <= 65535            |  |
| 6   | <b>LOS_GDT_ID</b><br>Identifies the GDT that is reporting this status information.      | Integer      | None       | 1 <= x <= 5                | 1 = Predator GDT<br>2 = APL GDT<br>3 = Outrider GDT<br>4 = Integrated Data Terminal<br>5 = TCDL  |

| <b>AV Line of Sight<br/>Ground Data<br/>Terminal Status<br/>Message Field</b> | <b>Data Element Name &amp;<br/>Description</b>   | <b>Data<br/>Type</b> | <b>Data Units</b> | <b>Range Values</b> | <b>Comments</b>                          |
|---|--|----------------------|-------------------|---------------------|--|
| 7   | <b>LOS_GDT_Signal_Strength_1</b><br>Indicates the strength of the signal received by receiver 1. | Integer              | Percent           | 0 <= x <= 100       | 0 = No signal.<br>100 = Full signal.     |
| 8   | <b>LOS_GDT_Signal_Strength_2</b><br>Indicates the strength of the signal received by receiver 2. | Integer              | Percent           | 0 <= x <= 100       | 0 = No signal.<br>100 = Full signal.     |
| 9   | <b>LOS_GDT_PLL_Status_1</b><br>Indicates if receiver 1's phase locked loop is currently locked.  | Integer              | N/A               | 0 <= x <= 1         | 0 = Not locked.<br>1 = Locked.           |
| 10  | <b>LOS_GDT_PLL_Status_2</b><br>Indicates if receiver 2's phase locked loop is currently locked.  | Integer              | N/A               | 0 <= x <= 1         | 0 = Not locked.<br>1 = Locked.           |
| 11  | <b>LOS_GDT_Carrier_Detect_1</b><br>Indicates if receiver 1 detects a valid carrier.              | Integer              | N/A               | 0 <= x <= 1         | 0 = No carrier.<br>1 = Carrier detected. |
| 12  | <b>LOS_GDT_Carrier_Detect_2</b><br>Indicates if receiver 2 detects a valid carrier.              | Integer              | N/A               | 0 <= x <= 1         | 0 = No carrier.<br>1 = Carrier detected. |
| 13  | <b>LOS_GDT_Range</b><br>Indicates the range to the AV as sensed by the GDT.                      | Double               | Miles             | 0 <= x <= 500       |  |
| 14  | <b>LOS_GDT_Uplink_Power_1</b><br>Indicates the commanded transmit power for transmitter 1.       | Double               | Watts             | 0 <= x <= 1000      | 0 = Not transmitting.                    |
| 15  | <b>LOS_GDT_Uplink_Power_2</b><br>Indicates the commanded transmit power for transmitter 2.       | Double               | Watts             | 0 <= x <= 1000      | 0 = Not transmitting.                    |

| AV Line of Sight<br>Ground Data<br>Terminal Status<br>Message Field | Data Element Name &<br>Description   | Data Type | Data Units         | Range Values       | Comments   |
|---|--|-----------|--------------------|--------------------|--|
| 16  | <b>LOS_GDT_CPU_Temp</b><br>Indicates the temperature measured at the GDT's CPU.                      | Double    | Degrees Fahrenheit | -80 <= x <= 250    |  |
| 17  | <b>LOS_GDT_TX1_Temp</b><br>Indicates the temperature measured at transmitter 1.                      | Double    | Degrees Fahrenheit | -80 <= x <= 250    |  |
| 18  | <b>LOS_GDT_TX2_Temp</b><br>Indicates the temperature measured at transmitter 2.                      | Double    | Degrees Fahrenheit | -80 <= x <= 250    |  |
| 19  | <b>LOS_GDT_TX1_Power_Temp</b><br>Indicates the temperature measured at transmitter 1's power supply. | Double    | Degrees Fahrenheit | -80 <= x <= 250    |  |
| 20  | <b>LOS_GDT_TX2_Power_Temp</b><br>Indicates the temperature measured at transmitter 2's power supply. | Double    | Degrees Fahrenheit | -80 <= x <= 250    |  |
| 21  | <b>LOS_GDT_TX1_Uplink_Freq</b><br>Indicates the commanded transmission frequency for transmitter 1.  | Double    | Megahertz          | 4400 <= x <= 18000 |  |
| 22  | <b>LOS_GDT_TX2_Uplink_Freq</b><br>Indicates the commanded transmission frequency for transmitter 2.  | Double    | Megahertz          | 4400 <= x <= 18000 |  |
| 23  | <b>LOS_GDT_RX1_Downlink_Freq</b><br>Indicates the commanded receive frequency for receiver 1.        | Double    | Megahertz          | 4400 <= x <= 18000 |  |
| 24  | <b>LOS_GDT_RX2_Downlink_Freq</b><br>Indicates the commanded transmission frequency for receiver 2.   | Double    | Megahertz          | 4400 <= x <= 18000 |  |
| 25  | <b>LOS_GDT_Transmitter_Selected</b><br>Indicates the transmitter currently selected for uplink data. | Integer   | None               | 0 <= x <= 2        | 0 = No transmitter selected.<br>1 = Transmitter 1 selected.<br>2 = Transmitter 2 selected. |

| <b>AV Line of Sight<br/>Ground Data<br/>Terminal Status<br/>Message Field</b> | <b>Data Element Name &amp;<br/>Description</b>  | <b>Data<br/>Type</b> | <b>Data Units</b> | <b>Range Values</b>     | <b>Comments</b>  |
|---|---|----------------------|-------------------|-------------------------|--|
| <b>26</b>   | <b>LOS_GDT_Cooling_Mode</b><br>Indicates the current mode of operation of the GDT's cooling system.   | Integer              | None              | $0 \leq x \leq 2$       | 0 = Off<br>1 = On, Manual<br>2 = Automatic   |
| <b>27</b>   | <b>LOS_GDT_28V_Power_Level</b><br>Indicates the current output voltage of the GDT's 28-volt power supply.   | Double               | Volts             | $0 \leq x \leq 100$     |  |
| <b>28</b>   | <b>LOS_GDT_Serial_Comm_Errors</b><br>Indicates the number of communication errors detected by the GDT in the serial GDT communications and control channel. | Integer              | Errors            | $0 \leq x \leq 1000000$ |  |
| <b>29</b>   | <b>LOS_GDT_Antenna_Selected</b><br>Indicates the antenna currently selected by the GDT.   | Integer              | None              | $0 \leq x \leq 2$       | 0 = None<br>1 = Omni<br>2 = Directional  |
| <b>30</b>   | <b>LOS_GDT_Pointing_Azimuth</b><br>Indicates the current pointing azimuth of the directional antenna.   | Double               | Degrees           | $0 \leq x < 360$        | Referenced to true North.  |
| <b>31</b>   | <b>LOS_GDT_Pointing_Elevation</b><br>Indicates the current pointing elevation of the directional antenna.   | Double               | Degrees           | $-90 \leq x \leq 90$    | Referenced to horizontal with positive up.   |
| <b>32</b>   | <b>LOS_GDT_Tracking_Mode</b><br>Indicates the current mode for determining directional antenna pointing information.  | Integer              | None              | $0 \leq x \leq 2$       | 0 = Manual pointing by GDT operator.<br>1 = Monopulse tracking.<br>2 = Pointing commands from TCS. |

#### 4.2.5.1.6 AV Line of Sight Air Data Terminal Status Message

This message is 140 bytes long.

| AV Line of Sight Air Data Terminal Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values               | Comments   |
|---|--|-----------|------------|----------------------------|--|
| 1   | <b>Message_ID</b><br>Identifies the message being transmitted.                                   | Integer   | None       | 6                          |  |
| 2   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.          | Integer   | None       | See AV Specific Appendices |  |
| 3   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                 | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                     | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                           | Integer   | None       | 1 <= x <= 65535            |  |
| 6   | <b>AV_LOS_Data_Link_Active</b><br>Indicates which LOS data links are currently active on the AV. | Integer   | None       | 0 <= x <= 3                | 0 = None, SATCOM Control<br>1 = C-band analog<br>2 = C-band digital<br>3 = Ku-band   |
| 7   | <b>AV_LOS_Ch_1_Uplink_Freq</b><br>Indicates the current frequency for ADT receiver 1.            | Double    | Megahertz  | 4400 <= x <= 18000         |  |
| 8   | <b>AV_LOS_Ch_2_Uplink_Freq</b><br>Indicates the current frequency for ADT receiver 2.            | Double    | Megahertz  | 4400 <= x <= 18000         |  |

| <b>AV Line of Sight Air Data Terminal Status Message Field</b> | <b>Data Element Name &amp; Description</b>  | <b>Data Type</b> | <b>Data Units</b> | <b>Range Values</b> | <b>Comments</b>   |
|--|---|------------------|-------------------|---------------------|---|
| <b>9</b>   | <b>AV_LOS_Ch_1_Downlink_Freq</b><br>Indicates the current frequency for ADT transmitter 1.                                      | Double           | Megahertz         | 4400 <= x <= 18000  |   |
| <b>10</b>  | <b>AV_LOS_Ch_2_Downlink_Freq</b><br>Indicates the current frequency for ADT transmitter 2.                                      | Double           | Megahertz         | 4400 <= x <= 18000  |   |
| <b>11</b>  | <b>AV_LOS_ADT_Antenna_Selected</b><br>Identifies the antenna(s) currently being used by the AV for the Line Of Sight data link. | Integer          | None              | 0 <= x <= 7         | 0 = None<br>1 = Omni 1<br>2 = Omni 2<br>3 = Omni 1 and Omni 2<br>4 = Directional<br>5 = Directional and Omni 1<br>6 = Directional and Omni 2<br>7 = Directional, Omni 1, and Omni 2 |
| <b>12</b>  | <b>AV_LOS_ADT_Ant_Select_Mode</b><br>Identifies the method the ADT uses to select the antenna to use for the LOS data link.     | Integer          | None              | 0 <= x <= 1         | 0 = Manual Selection by operator<br>1 = Automatic selection by AV   |
| <b>13</b>  | <b>AV_LOS_Pointing_Azimuth</b><br>Indicates the pointing azimuth of the antenna relative to true north.                         | Double           | None              | 0 <= x <= 360       | Referenced to true North.   |
| <b>14</b>  | <b>AV_LOS_Pointing_Elevation</b><br>Indicates the pointing elevation of the antenna relative to the local horizontal.           | Double           | None              | -90 <= x <= 90      | Positive value indicates up.  |
| <b>15</b>  | <b>AV_LOS_ADT_Transmitter_1_Stat</b><br>Indicates the current status of ADT transmitter 1.                                      | Integer          | None              | 0 <= x <= 4         | 0 = Off<br>1 = Becoming Ready<br>2 = Standby<br>3 = Active<br>4 = Failed  |

| AV Line of Sight<br>Air Data Terminal<br>Status Message<br>Field | Data Element Name &<br>Description  | Data<br>Type | Data Units | Range Values     | Comments   |
|--|---|--------------|------------|------------------|--|
| 16   | <b>AV_LOS_ADT_Transmitter_2_Stat</b><br>Indicates the current status of ADT transmitter 2.              | Integer      | None       | 0 <= x <= 4      | 0 = Off<br>1 = Becoming Ready<br>2 = Standby<br>3 = Active<br>4 = Failed |
| 17   | <b>AV_LOS_ADT_Tx_1_Power</b><br>Indicates the commanded transmission power for ADT transmitter 1.       | Double       | Watts      | 0 <= x <= 1000   |  |
| 18   | <b>AV_LOS_ADT_Tx_2_Power</b><br>Indicates the commanded transmission power for ADT transmitter 2.       | Double       | Watts      | 0 <= x <= 1000   |  |
| 19   | <b>AV_LOS_Receiver_1_Status</b><br>Indicates the current status of ADT receiver 1.                      | Integer      | None       | 0 <= x <= 3      | 0 = Off<br>1 = Becoming Ready<br>2 = Active<br>3 = Failed                |
| 20   | <b>AV_LOS_Receiver_2_Status</b><br>Indicates the current status of ADT receiver 2.                      | Integer      | None       | 0 <= x <= 3      | 0 = Off<br>1 = Becoming Ready<br>2 = Active<br>3 = Failed                |
| 21   | <b>AV_LOS_Sgnl_Strngth_1</b><br>Indicates the signal strength detected by ADT receiver 1.               | Integer      | Percent    | 0 <= x <= 100    | 0 = No signal<br>100 = Full signal                                       |
| 22   | <b>AV_LOS_Sgnl_Strngth_2</b><br>Indicates the signal strength detected by ADT receiver 2.               | Integer      | Percent    | 0 <= x <= 100    | 0 = No signal<br>100 = Full signal                                       |
| 23   | <b>AV_LOS_Rcvr_1_Cumul_Err</b><br>Indicates the cumulative number of bit errors detected by receiver 1. | Integer      | None       | 0 <= x <= 100000 |  |
| 24   | <b>AV_LOS_Rcvr_2_Cumul_Err</b><br>Indicates the cumulative number of bit errors detected by receiver 2. | Integer      | None       | 0 <= x <= 100000 |  |

#### 4.2.5.1.7 AV Piston Engine Status Message

This message is 204 bytes long.

| AV Piston Engine Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments   |
|---------------------------------------|---|-----------|------------|----------------------------|--|
| 1                                     | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 7                          |  |
| 2                                     | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |  |
| 3                                     | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                                     | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                                     | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                  | Integer   | None       | 1 <= x <= 65535            |  |
| 6                                     | <b>Engine_ID</b><br>Identifies the engine reporting in this message.                    | Integer   | None       | 1 <= x <= 2                | 1 = Forward or Starboard Engine<br>2 = Aft or Port Engine  |

| AV Piston Engine Status Message Field | Data Element Name & Description   | Data Type | Data Units             | Range Values     | Comments   |
|---------------------------------------|---|-----------|------------------------|------------------|--|
| 7                                     | <b>Engine_Status</b><br>Indicates the current running status of the engine.   | Integer   | None                   | 0 <= x <= 3      | 0 = Disabled<br>1 = Enabled, not running<br>2 = On, warming up<br>3 = On, normal |
| 8                                     | <b>Engine_Speed</b><br>Indicates the current engine speed in revolutions per minute (RPM)   | Integer   | Revolutions Per Minute | 0 <= x <= 10000  |  |
| 9                                     | <b>Engine_Throttle_Actuator_Position</b><br>Indicates the current position of the engine's throttle setting measured at the engine.     | Double    | None                   | 0 <= x <= 100    | 0 = Minimum throttle setting<br>100 = Maximum throttle setting                   |
| 10                                    | <b>Engine_Oil_Pressure</b><br>Indicates the current engine oil pressure in pounds per square inch (PSI).                                | Double    | Pounds Per Square Inch | 0 <= x <= 300    |  |
| 11                                    | <b>Engine_Coolant_Pressure</b><br>Indicates the current engine coolant pressure in pounds per square inch (PSI).                        | Double    | Pounds Per Square Inch | 0 <= x <= 300    |  |
| 12                                    | <b>Engine_Manifold_Pressure</b><br>Indicates the current engine manifold pressure in pounds per square inch (PSI).                      | Double    | Pounds Per Square Inch | 0 <= x <= 300    |  |
| 13                                    | <b>Engine_Fuel_Pressure</b><br>Indicates the current engine fuel pressure in pounds per square inch (PSI).                              | Double    | Pounds Per Square Inch | 0 <= x <= 300    |  |
| 14                                    | <b>Engine_Oil_Temperature</b><br>Indicates the current engine oil temperature in degrees Fahrenheit.                                    | Double    | Degrees Fahrenheit     | -80 <= x <= 500  |  |
| 15                                    | <b>Engine_Coolant_Temperature</b><br>Indicates the current engine coolant temperature in degrees Fahrenheit.                            | Double    | Degrees Fahrenheit     | -80 <= x <= 500  |  |
| 16                                    | <b>Engine_Exhaust_Temperature_1</b><br>Indicates the current engine exhaust temperature at point 1 in the engine in degrees Fahrenheit. | Double    | Degrees Fahrenheit     | -80 <= x <= 2000 |  |

| AV Piston Engine Status Message Field | Data Element Name & Description   | Data Type | Data Units         | Range Values     | Comments  |
|---------------------------------------|---|-----------|--------------------|------------------|---|
| 17                                    | <b>Engine_Exhaust_Temperature_2</b><br>Indicates the current engine exhaust temperature at point 2 in the engine in degrees Fahrenheit. | Double    | Degrees Fahrenheit | -80 <= x <= 2000 |   |
| 18                                    | <b>Engine_Exhaust_Temperature_3</b><br>Indicates the current engine exhaust temperature at point 3 in the engine in degrees Fahrenheit. | Double    | Degrees Fahrenheit | -80 <= x <= 2000 |   |
| 19                                    | <b>Engine_Exhaust_Temperature_4</b><br>Indicates the current engine exhaust temperature at point 4 in the engine in degrees Fahrenheit. | Double    | Degrees Fahrenheit | -80 <= x <= 2000 |   |
| 20                                    | <b>Engine_Cyl_Head_Temperature</b><br>Indicates the current engine cylinder head temperature in degrees Fahrenheit.                     | Double    | Degrees Fahrenheit | -80 <= x <= 2000 |   |
| 21                                    | <b>Engine_Manifold_Temperature</b><br>Indicates the current engine manifold temperature in degrees Fahrenheit.                          | Double    | Degrees Fahrenheit | -80 <= x <= 2000 |   |
| 22                                    | <b>Engine_Turbo_Oil_Temperature</b><br>Indicates the current oil temperature at the turbo charger.                                      | Double    | Degrees Fahrenheit | -55 <= x <= 1600 |   |
| 23                                    | <b>Engine_Oil_Level</b><br>Indicates the current engine oil level in quarts.  | Double    | Quarts             | 0 <= x <= 20     |   |
| 24                                    | <b>Engine_Fuel_Tank_Selected</b><br>Indicates the fuel tank currently supplying fuel to the engine reporting this message.              | Integer   | None               | 0 <= x <= 2,99   | 0 = None<br>1 = Fuel Tank 1<br>2 = Fuel Tank 2<br>99 = Fuel Tanks 1 and 2 |
| 25                                    | <b>Engine_Alternator_Current</b><br>Indicates the output current of the alternator of the engine reporting this message.                | Double    | Amps               | 0 <= x <= 200    |   |
| 26                                    | <b>Engine_Alternator_Voltage</b><br>Indicates the output voltage of the alternator of the engine reporting this message.                | Double    | Volts              | 0 <= x <= 400    |   |

| AV Piston Engine Status Message Field | Data Element Name & Description   | Data Type | Data Units         | Range Values     | Comments   |
|---------------------------------------|---|-----------|--------------------|------------------|--|
| 27                                    | <b>Engine_Alternator_Temperature</b><br>Indicates the current alternator temperature in degrees Fahrenheit. | Double    | Degrees Fahrenheit | -80 <= x <= 2000 |  |
| 28                                    | <b>Engine_Cooling_Fan_Status</b><br>Indicates the current operating mode of the engine cooling fan.         | Integer   | None               | 0 <= x <= 3      | 0 = Off, manual control<br>1 = On, manual control<br>2 = Off, automatic control<br>3 = On, automatic control |
| 29                                    | <b>Engine_Ignition_Coil_1_Enabled</b><br>Indicates if ignition coil 1 is enabled for this engine.           | Integer   | None               | 0 <= x <= 1      | 0 = Disabled<br>1 = Enabled  |
| 30                                    | <b>Engine_Ignition_Coil_2_Enabled</b><br>Indicates if ignition coil 2 is enabled for this engine.           | Integer   | None               | 0 <= x <= 1      | 0 = Disabled<br>1 = Enabled  |

#### 4.2.5.1.8 AV Fuel Status Message

This message is 68 bytes long.

| AV Fuel Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments                     |
|------------------------------|---|-----------|------------|----------------------------|------------------------------|
| 1                            | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 8                          |                              |
| 2                            | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |                              |
| 3                            | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider |

| AV Fuel Status Message Field | Data Element Name & Description   | Data Type | Data Units             | Range Values    | Comments   |
|------------------------------|---|-----------|------------------------|-----------------|--|
| 4                            | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.              | String    | None                   | N/A             | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                            | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                    | Integer   | None                   | 1 <= x <= 65535 |  |
| 6                            | <b>Fuel_Tank_ID</b><br>Identifies the fuel tank reporting in this status message          | Integer   | None                   | 1 <= x <= 4     | See AV Specific Appendices for definition of values.   |
| 7                            | <b>Fuel_Tank_Current_Level</b><br>Fuel remaining in this tank.                            | Double    | Pounds                 | 0 <= x <= 1000  |  |
| 8                            | <b>Fuel_Tank_Flow_Rate_Out</b><br>Identifies the rate at which fuel is exiting this tank. | Double    | Pounds per Hour        | 0 <= x <= 100   | Positive as fuel exits tank  |
| 9                            | <b>Fuel_Tank_Flow_Rate_In</b><br>Identifies the rate at which fuel is entering this tank. | Double    | Pounds per Hour        | 0 <= x <= 100   | Positive as fuel enters tank   |
| 10                           | <b>Fuel_Tank_Pressure</b><br>Identifies the current pressure in this fuel tank.           | Double    | Pounds per Square Inch | 0 <= x <= 100   |  |

#### 4.2.5.1.9 AV Electrical System Status Message

This message is 112 bytes long.

| AV Electrical System Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values               | Comments   |
|---|--|-----------|------------|----------------------------|--|
| 1   | <b>Message_ID</b><br>Identifies the message being transmitted.                                   | Integer   | None       | 9                          |  |
| 2   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.          | Integer   | None       | See AV Specific Appendices |  |
| 3   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                 | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                     | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                           | Integer   | None       | 1 <= x <= 65535            |  |
| 6   | <b>AV_40VDC_Bus_Voltage</b><br>Indicates the Air Vehicles 40 VDC power distribution bus voltage  | Double    | Volts      | -100 <= x <= 100           |  |
| 7   | <b>AV_28VDC_Bus_Voltage</b><br>Indicates the Air Vehicle's 24 VDC power distribution bus voltage | Double    | Volts      | -100 <= x <= 100           |  |
| 8   | <b>AV_Battery_Voltage_1</b><br>Indicates the voltage across battery 1's terminals.               | Double    | Volts      | 0 <= x <= 400              |  |

| AV Electrical System Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values     | Comments                                      |
|---|--|-----------|------------|------------------|---|
| 9   | <b>AV_Battery_Current_1</b><br>Indicates the current into battery 1.               | Double    | Amps       | -100 <= x <= 100 | Positive value indicates battery is charging. |
| 10  | <b>AV_Battery_Voltage_2</b><br>Indicates the voltage across battery 2's terminals. | Double    | Volts      | 0 <= x <= 400    |   |
| 11  | <b>AV_Battery_Current_2</b><br>Indicates the current into battery 2.               | Double    | Amps       | -100 <= x <= 100 | Positive value indicates battery is charging. |
| 12  | <b>AV_Battery_Voltage_3</b><br>Indicates the voltage across battery 3's terminals. | Double    | Volts      | 0 <= x <= 400    |   |
| 13  | <b>AV_Battery_Current_3</b><br>Indicates the current into battery 3.               | Double    | Amps       | -100 <= x <= 100 | Positive value indicates battery is charging. |
| 14  | <b>AV_Battery_Voltage_4</b><br>Indicates the voltage across battery 4's terminals. | Double    | Volts      | 0 <= x <= 400    |   |
| 15  | <b>AV_Battery_Current_4</b><br>Indicates the current into battery 4.               | Double    | Amps       | -100 <= x <= 100 | Positive value indicates battery is charging. |

#### 4.2.5.1.10 AV Analog Video System Status Message

This message is 120 bytes long.

| <b>AV Analog Video System Status Message Field</b> | <b>Data Element Name &amp; Description</b>  | <b>Data Type</b> | <b>Data Units</b> | <b>Range Values</b>        | <b>Comments</b>  |
|--|---|------------------|-------------------|----------------------------|--|
| <b>1</b>   | <b>Message_ID</b><br>Identifies the message being transmitted.  | Integer          | None              | 10                         |  |
| <b>2</b>   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.                       | Integer          | None              | See AV Specific Appendices |  |
| <b>3</b>   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.  | Integer          | None              | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| <b>4</b>   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                                  | String           | None              | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| <b>5</b>   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.  | Integer          | None              | 1 <= x <= 65535            |  |
| <b>6</b>   | <b>AV_Video_Mux_Power</b><br>Indicates if power is applied to the AV's video distribution MUX.                | Integer          | None              | 0 <= x <= 1                | 0 = Off<br>1 = On  |
| <b>7</b>   | <b>AV_Video_Downlink_Ch_1_Source</b><br>Indicates the video source routed to channel 1 of the video downlink. | Integer          | None              | 0 <= x <= 10               | 0 = None<br>For other values see AV specific appendices  |
| <b>8</b>   | <b>AV_Video_Downlink_Ch_2_Source</b><br>Indicates the video source routed to channel 2 of the video downlink. | Integer          | None              | 0 <= x <= 10               | 0 = None<br>For other values see AV specific appendices  |

| <b>AV Analog Video System Status Message Field</b> | <b>Data Element Name &amp; Description</b>  | <b>Data Type</b> | <b>Data Units</b> | <b>Range Values</b>        | <b>Comments</b>  |
|--|---|------------------|-------------------|----------------------------|--|
| <b>9</b>   | <b>AV_Video_Downlink_Ch_3_Source</b><br>Indicates the video source routed to channel 3 of the video downlink.         | Integer          | None              | $0 \leq x \leq 10$         | 0 = None<br>For other values see AV specific appendices  |
| <b>10</b>  | <b>AV_Video_Downlink_Ch_4_Source</b><br>Indicates the video source routed to channel 4 of the video downlink.         | Integer          | None              | $0 \leq x \leq 10$         | 0 = None<br>For other values see AV specific appendices  |
| <b>11</b>  | <b>AV_VCR_Power_1</b><br>Indicates if the AV's VCR 1 is currently powered on.   | Integer          | None              | $0 \leq x \leq 1$          | 0 = Off<br>1 = On  |
| <b>12</b>  | <b>AV_VCR_Mode_1</b><br>Indicates the current operating mode of the AV's VCR 1.                                       | Integer          | None              | $0 \leq x \leq 5$          | 0 = Tape not loaded<br>1 = Stopped<br>2 = Fast Forward<br>3 = Rewind<br>4 = Play<br>5 = Record<br>6 = Rewind Search<br>7 = Fast Forward Search |
| <b>13</b>  | <b>AV_VCR_Counter_1</b><br>Indicates the current value of the AV VCR 1's tape counter.                                | Integer          | Seconds           | $-21600 \leq x \leq 21600$ |  |
| <b>14</b>  | <b>AV_VCR_Record_Source_1</b><br>Indicates the video source currently routed to the AV's VCR 1 by the AV's video MUX. | Integer          | None              | $0 \leq x \leq 10$         | 0 = None<br>For other values see AV specific appendices  |
| <b>15</b>  | <b>AV_VCR_Power_2</b><br>Indicates if the AV's VCR 2 is currently powered on.   | Integer          | None              | $0 \leq x \leq 1$          | 0 = Off<br>1 = On  |

| <b>AV Analog Video System Status Message Field</b> | <b>Data Element Name &amp; Description</b>  | <b>Data Type</b> | <b>Data Units</b> | <b>Range Values</b>        | <b>Comments</b>  |
|--|---|------------------|-------------------|----------------------------|--|
| <b>16</b>  | <b>AV_VCR_Mode_2</b><br>Indicates the current operating mode of the AV's VCR 2.                                       | Integer          | None              | $0 \leq x \leq 5$          | 0 = Tape not loaded<br>1 = Stopped<br>2 = Fast Forward<br>3 = Rewind<br>4 = Play<br>5 = Record<br>6 = Rewind Search<br>7 = Fast Forward Search |
| <b>17</b>  | <b>AV_VCR_Counter_2</b><br>Indicates the current value of the AV VCR 2's tape counter.                                | Integer          | Seconds           | $-21600 \leq x \leq 21600$ |  |
| <b>18</b>  | <b>AV_VCR_Record_Source_2</b><br>Indicates the video source currently routed to the AV's VCR 2 by the AV's video MUX. | Integer          | None              | $0 \leq x \leq 10$         | 0 = None<br>For other values see AV specific appendices  |
| <b>19</b>  | <b>AV_VCR_Power_3</b><br>Indicates if the AV's VCR 3 is currently powered on.   | Integer          | None              | $0 \leq x \leq 1$          | 0 = Off<br>1 = On  |
| <b>20</b>  | <b>AV_VCR_Mode_3</b><br>Indicates the current operating mode of the AV's VCR 3.                                       | Integer          | None              | $0 \leq x \leq 5$          | 0 = Tape not loaded<br>1 = Stopped<br>2 = Fast Forward<br>3 = Rewind<br>4 = Play<br>5 = Record<br>6 = Rewind Search<br>7 = Fast Forward Search |
| <b>21</b>  | <b>AV_VCR_Counter_3</b><br>Indicates the current value of the AV VCR 3's tape counter.                                | Integer          | Seconds           | $-21600 \leq x \leq 21600$ |  |
| <b>22</b>  | <b>AV_VCR_Record_Source_3</b><br>Indicates the video source currently routed to the AV's VCR 3 by the AV's video MUX. | Integer          | None              | $0 \leq x \leq 10$         | 0 = None<br>For other values see AV specific appendices  |

| <b>AV Analog Video System Status Message Field</b> | <b>Data Element Name &amp; Description</b>  | <b>Data Type</b> | <b>Data Units</b> | <b>Range Values</b>        | <b>Comments</b>  |
|--|---|------------------|-------------------|----------------------------|--|
| <b>23</b>  | <b>AV_VCR_Power_4</b><br>Indicates if the AV's VCR 4 is currently powered on.   | Integer          | None              | $0 \leq x \leq 1$          | 0 = Off<br>1 = On  |
| <b>24</b>  | <b>AV_VCR_Mode_4</b><br>Indicates the current operating mode of the AV's VCR 4.                                       | Integer          | None              | $0 \leq x \leq 5$          | 0 = Tape not loaded<br>1 = Stopped<br>2 = Fast Forward<br>3 = Rewind<br>4 = Play<br>5 = Record<br>6 = Rewind Search<br>7 = Fast Forward Search |
| <b>25</b>  | <b>AV_VCR_Counter_4</b><br>Indicates the current value of the AV VCR 4's tape counter.                                | Integer          | Seconds           | $-21600 \leq x \leq 21600$ |  |
| <b>26</b>  | <b>AV_VCR_Record_Source_4</b><br>Indicates the video source currently routed to the AV's VCR 4 by the AV's video MUX. | Integer          | None              | $0 \leq x \leq 10$         | 0 = None<br>For other values see AV specific appendices  |
| <b>27</b>  | <b>AV_Nose_Camera_Lens_Heater</b><br>Indicates the current status of the nose camera lens heater.                     | Integer          | None              | $0 \leq x \leq 1$          | 0 = Off<br>1 = On  |

#### 4.2.5.1.11 AV Lights and Landing Gear Status Message

This message is 60 bytes long.

| AV Lights and Landing Gear Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments   |
|---|---|-----------|------------|----------------------------|--|
| 1   | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 11                         |  |
| 2   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |  |
| 3   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                  | Integer   | None       | 1 <= x <= 65535            |  |
| 6   | <b>AV_Navigation_Lights</b><br>Indicates if the navigation lights are on or off.        | Integer   | None       | 0 <= x <= 1                | 0 = off<br>1 = on  |
| 7   | <b>AV_Landing_Lights</b><br>Indicates if the landing lights are on or off.              | Integer   | None       | 0 <= x <= 1                | 0 = off<br>1 = on  |
| 8   | <b>AV_Strobe_Light</b><br>Indicates if the strobe light is on or off.                   | Integer   | None       | 0 <= x <= 1                | 0 = off<br>1 = on  |

| AV Lights and Landing Gear Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values | Comments                                  |
|---|--|-----------|------------|--------------|---|
| 9   | <b>AV_Hazard_Beacon</b><br>Indicates if the radiation hazard beacon is on or off.                          | Integer   | None       | 0 <= x <= 1  | 0 = off<br>1 = on                         |
| 10  | <b>AV_Nose_Landing_Gear</b><br>Indicates the status of the Air Vehicle's nose landing gear.                | Integer   | None       | 0 <= x <= 2  | 0 = up<br>1 = down<br>2 = down and locked |
| 11  | <b>AV_Port_Landing_Gear</b><br>Indicates the status of the Air Vehicle's port side landing gear.           | Integer   | None       | 0 <= x <= 2  | 0 = up<br>1 = down<br>2 = down and locked |
| 12  | <b>AV_Starboard_Landing_Gear</b><br>Indicates the status of the Air Vehicle's starboard side landing gear. | Integer   | None       | 0 <= x <= 2  | 0 = up<br>1 = down<br>2 = down and locked |

#### 4.2.5.1.12 AV IFF Status Message

This message is 76 bytes long.

| AV IFF Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments                     |
|-----------------------------|---|-----------|------------|----------------------------|------------------------------|
| 1                           | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 12                         |                              |
| 2                           | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |                              |
| 3                           | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider |

| AV IFF Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values    | Comments   |
|-----------------------------|--|-----------|------------|-----------------|--|
| 4                           | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.               | String    | None       | N/A             | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4 byte string length element making the total field length 16 bytes. |
| 5                           | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                     | Integer   | None       | 1 <= x <= 65535 |  |
| 6                           | <b>AV_IFF_Power</b><br>Indicates if the Air Vehicle's IFF is powered on.                   | Integer   | None       | 0 <= x <= 1     | 0 = Off<br>1 = On  |
| 7                           | <b>AV_IFF_Mode_C</b><br>Indicates if the Air Vehicle's IFF Mode C capability is enabled.   | Integer   | None       | 0 <= x <= 1     | 0 = Off<br>1 = On  |
| 8                           | <b>AV_IFF_Mode_1</b><br>Indicates if the Air Vehicle's IFF Mode 1 capability is enabled.   | Integer   | None       | 0 <= x <= 1     | 0 = Off<br>1 = On  |
| 9                           | <b>AV_IFF_Mode_1_Code</b><br>Indicates the code the IFF will squawk.                       | Integer   | None       | 1 <= x <= 4096  | This value is the decimal value of the octal code.   |
| 10                          | <b>AV_IFF_Mode_2</b><br>Indicates if the Air Vehicle's IFF Mode 2 capability is enabled.   | Integer   | None       | 0 <= x <= 1     | 0 = Off<br>1 = On  |
| 11                          | <b>AV_IFF_Mode_3A</b><br>Indicates if the Air Vehicle's IFF Mode 3A capability is enabled. | Integer   | None       | 0 <= x <= 1     | 0 = Mode 3A disabled<br>1 = Mode 3A enabled  |
| 12                          | <b>AV_IFF_Mode_3A_Code</b><br>Indicates the code the IFF will squawk.                      | Integer   | None       | 1 <= x <= 4096  | This value is the decimal value of the octal code.   |

| AV IFF Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values   | Comments   |
|-----------------------------|--|-----------|------------|----------------|--|
| 13                          | <b>AV_IFF_Mode_4</b><br>Indicates if the Air Vehicle's IFF Mode 4 capability is enabled. | Integer   | None       | 0 <= x <= 1    | 0 = Mode 4 disabled<br>1 = Mode 4 enabled          |
| 14                          | <b>AV_IFF_Mode_4_Code</b><br>Indicates the code the IFF will squawk.                     | Integer   | None       | 1 <= x <= 4096 | This value is the decimal value of the octal code. |
| 15                          | <b>AV_IFF_Mode_4_Hold</b><br>Indicates if the mode 4 hold is on.                         | Integer   | None       | 0 <= x <= 1    | 0 = No hold<br>1 = Hold                            |
| 16                          | <b>AV_IFF_Operational_Mode</b><br>Indicates the current operating mode of the IFF.       | Integer   | None       | 1 <= x <= 3    | 1 = Standby<br>2 = Normal<br>3 = Emergency         |

#### 4.2.5.1.13 AV SAR Status Message

This message is 128 bytes long.

| AV SAR Status Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments                     |
|-----------------------------|---|-----------|------------|----------------------------|------------------------------|
| 1                           | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 15                         |                              |
| 2                           | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |                              |
| 3                           | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider |

| AV SAR Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values     | Comments   |
|-----------------------------|--|-----------|------------|------------------|--|
| 4                           | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.   | String    | None       | N/A              | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                           | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.   | Integer   | None       | 1 <= x <= 65535  |  |
| 6                           | <b>SAR_State</b><br>Indicates the state of SAR payload.  | Integer   | None       | 0 <= x <= 4      | 0 = Off<br>1 = Standby<br>2 = Power-on self test<br>3 = Initiated test<br>4 = Active   |
| 7                           | <b>SAR_Resolution_X</b><br>Indicates the resolution in pixels of the SAR frame along the axis parallel to the top and bottom edges of the frame. | Integer   | Pixels     | 512 <= x <= 4096 |  |
| 8                           | <b>SAR_Resolution_Y</b><br>Indicates the resolution of the SAR frame along the axis parallel to the left and right edges of the frame.           | Integer   | Pixels     | 512 <= x <= 4096 |  |
| 9                           | <b>SAR_Scene_Nbr</b><br>Indicates the current scene number of the SAR payload.   | Integer   | None       | 0 <= x <= 33000  |  |
| 10                          | <b>SAR_Center_FOV_Lat</b><br>Indicates the latitude of the center of the FOV for the most recent SAR frame collected                             | Double    | Degrees    | -90 <= x <= 90   | Positive value indicates North latitude.   |
| 11                          | <b>SAR_Center_FOV_Lon</b><br>Indicates the longitude of the center of the FOV for the most recent SAR frame collected                            | Double    | Degrees    | -180 < x <= 180  | Positive value indicates East longitude.   |

| AV SAR Status Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values    | Comments   |
|-----------------------------|--|-----------|------------|-----------------|--|
| 12                          | <b>SAR_Frame_Corner_1_Lat</b><br>Indicates the latitude of corner 1 of the current SAR footprint.  | Double    | Degrees    | -90 <= x <= 90  | Corners are numbered consecutively around the footprint. |
| 13                          | <b>SAR_Frame_Corner_1_Lon</b><br>Indicates the longitude of corner 1 of the current SAR footprint. | Double    | Degrees    | -180 < x <= 180 | Corners are numbered consecutively around the footprint. |
| 14                          | <b>SAR_Frame_Corner_2_Lat</b><br>Indicates the latitude of corner 2 of the current SAR footprint.  | Double    | Degrees    | -90 <= x <= 90  | Corners are numbered consecutively around the footprint. |
| 15                          | <b>SAR_Frame_Corner_2_Lon</b><br>Indicates the longitude of corner 2 of the current SAR footprint. | Double    | Degrees    | -180 < x <= 180 | Corners are numbered consecutively around the footprint. |
| 16                          | <b>SAR_Frame_Corner_3_Lat</b><br>Indicates the latitude of corner 3 of the current SAR footprint.  | Double    | Degrees    | -90 <= x <= 90  | Corners are numbered consecutively around the footprint. |
| 17                          | <b>SAR_Frame_Corner_3_Lon</b><br>Indicates the longitude of corner 3 of the current SAR footprint. | Double    | Degrees    | -180 < x <= 180 | Corners are numbered consecutively around the footprint. |
| 18                          | <b>SAR_Frame_Corner_4_Lat</b><br>Indicates the latitude of corner 4 of the current SAR footprint.  | Double    | Degrees    | -90 <= x <= 90  | Corners are numbered consecutively around the footprint. |
| 19                          | <b>SAR_Frame_Corner_4_Lon</b><br>Indicates the longitude of corner 4 of the current SAR footprint. | Double    | Degrees    | -180 < x <= 180 | Corners are numbered consecutively around the footprint. |

#### 4.2.5.1.14 AV Warning Message

This message is used to pass alerts and warnings from the DCM to the TCS Real Time Component. It shall be generated by the DCM at a rate between 0.25 Hz and 4 Hz. All alerts are considered to be edge triggered and once set will be held high by the TCS Real Time Component until they are cleared by the DCM. The AV Warning Message contains 25 alert fields with associated alert level fields allowing multiple alerts to be included in a single message.

For the N alert set or clear events to be included in a single message, the appropriate alert IDs will be placed in the first AV\_Number\_Alert\_Updates alert fields with the associated set or clear values in the first AV\_Number\_Alert\_Updates alert level fields.

The remaining 25 - AV\_Number\_Alert\_Updates alert fields shall be filled with the current status of 25- AV\_Number\_Alert\_Updates alerts that may or may not have been set or cleared in this message. The alerts included in these 25- AV\_Number\_Alert\_Updates fields shall be selected such that the status of all the possible alerts is transferred from the DCM to the TCS Real Time Component before the status of an alert is retransmitted in this manner. This is done to ensure the alert state information in the DCM and the TCS Real Time Component is synchronized and in the event an alert set or clear event is missed by the TCS, it will eventually be updated by this alert state update mechanism.

This message is 236 bytes long.

| AV Warning Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments   |
|--------------------------|---|-----------|------------|----------------------------|--|
| 1                        | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 19                         |  |
| 2                        | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |  |
| 3                        | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                        | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |

| AV Warning Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values    | Comments  |
|--------------------------|---|-----------|------------|-----------------|---|
| 5                        | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                                | Integer   | None       | 1 <= x <= 65535 |   |
| 6                        | <b>AV_Number_Alert_Updates</b><br>Identifies how many of the alert statuses below are new conditions. | Integer   | N/A        | 0 <= x <= 25    |   |
| 7                        | <b>AV_Alert_1</b><br>Indicates the Alert ID of alert 1 in this message.                               | Integer   | N/A        |                 | The values of the alerts are defined in the AV Specific Appendices. |
| 8                        | <b>AV_Alert_Level_1</b><br>Indicates the new level of alert 1.  | Integer   | N/A        | 0 <= x <= 2     | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 9                        | <b>AV_Alert_2</b><br>Indicates the Alert ID of alert 2 in this message.                               | Integer   | N/A        |                 | The values of the alerts are defined in the AV Specific Appendices. |
| 10                       | <b>AV_Alert_Level_2</b><br>Indicates the new level of alert 2.  | Integer   | N/A        | 0 <= x <= 2     | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 11                       | <b>AV_Alert_3</b><br>Indicates the Alert ID of alert 3 in this message.                               | Integer   | N/A        |                 | The values of the alerts are defined in the AV Specific Appendices. |
| 12                       | <b>AV_Alert_Level_3</b><br>Indicates the new level of alert 3.  | Integer   | N/A        | 0 <= x <= 2     | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 13                       | <b>AV_Alert_4</b><br>Indicates the Alert ID of alert 4 in this message.                               | Integer   | N/A        |                 | The values of the alerts are defined in the AV Specific Appendices. |
| 14                       | <b>AV_Alert_Level_4</b><br>Indicates the new level of alert 4.  | Integer   | N/A        | 0 <= x <= 2     | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 15                       | <b>AV_Alert_5</b><br>Indicates the Alert ID of alert 5 in this message.                               | Integer   | N/A        |                 | The values of the alerts are defined in the AV Specific Appendices. |

| AV Warning Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values | Comments  |
|--------------------------|---|-----------|------------|--------------|---|
| 16                       | <b>AV_Alert_Level_5</b><br>Indicates the new level of alert 5.            | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 17                       | <b>AV_Alert_6</b><br>Indicates the Alert ID of alert 6 in this message.   | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 18                       | <b>AV_Alert_Level_6</b><br>Indicates the new level of alert 6.            | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 19                       | <b>AV_Alert_7</b><br>Indicates the Alert ID of alert 7 in this message.   | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 20                       | <b>AV_Alert_Level_7</b><br>Indicates the new level of alert 7.            | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 21                       | <b>AV_Alert_8</b><br>Indicates the Alert ID of alert 8 in this message.   | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 22                       | <b>AV_Alert_Level_8</b><br>Indicates the new level of alert 8.            | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 23                       | <b>AV_Alert_9</b><br>Indicates the Alert ID of alert 9 in this message.   | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 24                       | <b>AV_Alert_Level_9</b><br>Indicates the new level of alert 9.            | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 25                       | <b>AV_Alert_10</b><br>Indicates the Alert ID of alert 10 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 26                       | <b>AV_Alert_Level_10</b><br>Indicates the new level of alert 10.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |

| AV Warning Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values | Comments  |
|--------------------------|---|-----------|------------|--------------|---|
| 27                       | <b>AV_Alert_11</b><br>Indicates the Alert ID of alert 11 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 28                       | <b>AV_Alert_Level_11</b><br>Indicates the new level of alert 11.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 29                       | <b>AV_Alert_12</b><br>Indicates the Alert ID of alert 12 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 30                       | <b>AV_Alert_Level_12</b><br>Indicates the new level of alert 12.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 31                       | <b>AV_Alert_13</b><br>Indicates the Alert ID of alert 13 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 32                       | <b>AV_Alert_Level_13</b><br>Indicates the new level of alert 13.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 33                       | <b>AV_Alert_14</b><br>Indicates the Alert ID of alert 14 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 34                       | <b>AV_Alert_Level_14</b><br>Indicates the new level of alert 14.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 35                       | <b>AV_Alert_15</b><br>Indicates the Alert ID of alert 15 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 36                       | <b>AV_Alert_Level_15</b><br>Indicates the new level of alert 15.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 37                       | <b>AV_Alert_16</b><br>Indicates the Alert ID of alert 16 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |

| AV Warning Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values | Comments  |
|--------------------------|---|-----------|------------|--------------|---|
| 38                       | <b>AV_Alert_Level_16</b><br>Indicates the new level of alert 16.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 39                       | <b>AV_Alert_17</b><br>Indicates the Alert ID of alert 17 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 40                       | <b>AV_Alert_Level_17</b><br>Indicates the new level of alert 17.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 41                       | <b>AV_Alert_18</b><br>Indicates the Alert ID of alert 18 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 42                       | <b>AV_Alert_Level_18</b><br>Indicates the new level of alert 18.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 43                       | <b>AV_Alert_19</b><br>Indicates the Alert ID of alert 19 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 44                       | <b>AV_Alert_Level_19</b><br>Indicates the new level of alert 19.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 45                       | <b>AV_Alert_20</b><br>Indicates the Alert ID of alert 20 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 46                       | <b>AV_Alert_Level_20</b><br>Indicates the new level of alert 20.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 47                       | <b>AV_Alert_21</b><br>Indicates the Alert ID of alert 21 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 48                       | <b>AV_Alert_Level_21</b><br>Indicates the new level of alert 21.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |

| AV Warning Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values | Comments  |
|--------------------------|---|-----------|------------|--------------|---|
| 49                       | <b>AV_Alert_22</b><br>Indicates the Alert ID of alert 22 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 50                       | <b>AV_Alert_Level_22</b><br>Indicates the new level of alert 22.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 51                       | <b>AV_Alert_23</b><br>Indicates the Alert ID of alert 23 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 52                       | <b>AV_Alert_Level_23</b><br>Indicates the new level of alert 23.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 53                       | <b>AV_Alert_24</b><br>Indicates the Alert ID of alert 24 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 54                       | <b>AV_Alert_Level_24</b><br>Indicates the new level of alert 24.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |
| 55                       | <b>AV_Alert_25</b><br>Indicates the Alert ID of alert 25 in this message. | Integer   | N/A        |              | The values of the alerts are defined in the AV Specific Appendices. |
| 56                       | <b>AV_Alert_Level_25</b><br>Indicates the new level of alert 25.          | Integer   | N/A        | 0 <= x <= 2  | 0 = Clear<br>1 = Yellow<br>2 = Red                                  |

#### 4.2.5.1.15 DCM Protocol Error Message

This message is used by the DCM to report that it has detected an error in a message sent to it by the TCS RTP. This message is 168 bytes in length.

| <b>AV Warning Message Field</b> | <b>Data Element Name &amp; Description</b>   | <b>Data Type</b> | <b>Data Units</b> | <b>Range Values</b>        | <b>Comments</b>  |
|---------------------------------|--|------------------|-------------------|----------------------------|--|
| 1                               | <b>Message_ID</b><br>Identifies the message being transmitted.                                     | Integer          | None              | 37                         |  |
| 2                               | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.            | Integer          | None              | See AV Specific Appendices |  |
| 3                               | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                   | Integer          | None              | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                               | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                       | String           | None              | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                               | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                             | Integer          | None              | 1 <= x <= 65535            |  |
| 6                               | <b>Offending_Message_ID</b><br>Identifies the Message_ID of the message the error was detected in. | Integer          | None              | 1 <= x <= 37               |  |
| 7                               | <b>Error_Message</b><br>Describes the error detected by the DCM.                                   | String           | None              | N/A                        | This field is a 128 byte fixed length string. It shall be left justified.  |

#### 4.2.5.1.16 DCM Mission Load Acknowledge Message

This message is 44 bytes long.

| DCM Mission Load Acknowledge Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values               | Comments   |
|--|--|-----------|------------|----------------------------|--|
| 1  | <b>Message_ID</b><br>Identifies the message being transmitted.                                     | Integer   | None       | 38                         |  |
| 2  | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.            | Integer   | None       | See AV Specific Appendices |  |
| 3  | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                   | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4  | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                       | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5  | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                             | Integer   | None       | 1 <= x <= 65535            |  |
| 6  | <b>New_Mission_Plan_ID</b><br>Identifies the ID of the mission plan this message is acknowledging. | Integer   | None       | 1 <= x <= 8000             |  |

| DCM Mission Load Acknowledge Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values  | Comments   |
|--|---|-----------|------------|---|--|
| 7  | <b>Mission_Plan_Load_Ack</b><br>Acknowledges the successful upload and verification of the mission plan.  | Integer   | None       | $1 \leq x \leq 6$   | 1 = Mission plan successfully uploaded and verified.<br>2 = Mission plan successfully uploaded but failed verification.<br>3 = Waypoints arrived out of order.<br>4 = Waypoint had too many commands.<br>5 = Waypoint did not have enough commands.<br>6 = Error detected in message for a waypoint. |
| 8  | <b>Last_Waypoint_Received</b><br>Identifies the last waypoint successfully received for this mission plan. If the transfer was successful this field should equal the number of waypoint in the mission plan. | Integer   | None       | $0 \leq x \leq$ Number of waypoints in mission plan being transferred | 0 = Error detected in waypoint 1.  |

#### 4.2.5.1.17 AV Servo Status Message

This message is 352 bytes long.

| AV Servo Status Message Message Field | Data Element Name & Description                                | Data Type | Data Units | Range Values | Comments |
|---------------------------------------|--|-----------|------------|--------------|----------|
| 1                                     | <b>Message_ID</b><br>Identifies the message being transmitted. | Integer   | None       | 39           |          |

| AV Servo Status<br>Message Message<br>Field | Data Element Name &<br>Description  | Data<br>Type | Data<br>Units         | Range Values               | Comments   |
|---|---|--------------|-----------------------|----------------------------|--|
| 2   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer      | None                  | See AV Specific Appendices |  |
| 3   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer      | None                  | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String       | None                  | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                  | Integer      | None                  | 1 <= x <= 65535            |  |
| 6   | <b>AV_Servo_1_Current</b><br>Identifies the current draw in amps for servo 1.           | Double       | Amps                  | 0 >= x >= 50               | Mapping to specific servos on the Air Vehicles is in the AV specific appendices.   |
| 7   | <b>AV_Servo_1_Temperature</b><br>Identifies the temperature measured at servo 1.        | Double       | Degrees<br>Fahrenheit | -60 >= x >= 500            | Mapping to specific servos on the Air Vehicles is in the AV specific appendices.   |
| 8   | <b>AV_Servo_2_Current</b><br>Identifies the current draw in amps for servo 2.           | Double       | Amps                  | 0 >= x >= 50               | Mapping to specific servos on the Air Vehicles is in the AV specific appendices.   |
| 9   | <b>AV_Servo_2_Temperature</b><br>Identifies the temperature measured at servo 2.        | Double       | Degrees<br>Fahrenheit | -60 >= x >= 500            | Mapping to specific servos on the Air Vehicles is in the AV specific appendices.   |

| AV Servo Status Message Message Field | Data Element Name & Description  | Data Type | Data Units         | Range Values    | Comments   |
|---------------------------------------|--|-----------|--------------------|-----------------|--|
| 10                                    | <b>AV_Servo_3_Current</b><br>Identifies the current draw in amps for servo 3.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 11                                    | <b>AV_Servo_3_Temperature</b><br>Identifies the temperature measured at servo 3. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 12                                    | <b>AV_Servo_4_Current</b><br>Identifies the current draw in amps for servo 4.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 13                                    | <b>AV_Servo_4_Temperature</b><br>Identifies the temperature measured at servo 4. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 14                                    | <b>AV_Servo_5_Current</b><br>Identifies the current draw in amps for servo 5.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 15                                    | <b>AV_Servo_5_Temperature</b><br>Identifies the temperature measured at servo 5. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 16                                    | <b>AV_Servo_6_Current</b><br>Identifies the current draw in amps for servo 6.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 17                                    | <b>AV_Servo_6_Temperature</b><br>Identifies the temperature measured at servo 6. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 18                                    | <b>AV_Servo_7_Current</b><br>Identifies the current draw in amps for servo 7.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 19                                    | <b>AV_Servo_7_Temperature</b><br>Identifies the temperature measured at servo 7. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |

| AV Servo Status<br>Message Message<br>Field | Data Element Name &<br>Description   | Data<br>Type | Data<br>Units      | Range Values    | Comments   |
|---|--|--------------|--------------------|-----------------|--|
| 20  | <b>AV_Servo_8_Current</b><br>Identifies the current draw in amps for servo 8.      | Double       | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 21  | <b>AV_Servo_8_Temperature</b><br>Identifies the temperature measured at servo 8.   | Double       | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 22  | <b>AV_Servo_9_Current</b><br>Identifies the current draw in amps for servo 9.      | Double       | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 23  | <b>AV_Servo_9_Temperature</b><br>Identifies the temperature measured at servo 9.   | Double       | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 24  | <b>AV_Servo_10_Current</b><br>Identifies the current draw in amps for servo 10.    | Double       | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 25  | <b>AV_Servo_10_Temperature</b><br>Identifies the temperature measured at servo 10. | Double       | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 26  | <b>AV_Servo_11_Current</b><br>Identifies the current draw in amps for servo 11.    | Double       | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 27  | <b>AV_Servo_11_Temperature</b><br>Identifies the temperature measured at servo 11. | Double       | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 28  | <b>AV_Servo_12_Current</b><br>Identifies the current draw in amps for servo 12.    | Double       | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 29  | <b>AV_Servo_12_Temperature</b><br>Identifies the temperature measured at servo 12. | Double       | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |

| AV Servo Status Message Message Field | Data Element Name & Description  | Data Type | Data Units         | Range Values    | Comments   |
|---------------------------------------|--|-----------|--------------------|-----------------|--|
| 30                                    | <b>AV_Servo_13_Current</b><br>Identifies the current draw in amps for servo 13.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 31                                    | <b>AV_Servo_13_Temperature</b><br>Identifies the temperature measured at servo 13. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 32                                    | <b>AV_Servo_14_Current</b><br>Identifies the current draw in amps for servo 14.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 33                                    | <b>AV_Servo_14_Temperature</b><br>Identifies the temperature measured at servo 14. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 34                                    | <b>AV_Servo_15_Current</b><br>Identifies the current draw in amps for servo 15.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 35                                    | <b>AV_Servo_15_Temperature</b><br>Identifies the temperature measured at servo 15. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 36                                    | <b>AV_Servo_16_Current</b><br>Identifies the current draw in amps for servo 16.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 37                                    | <b>AV_Servo_16_Temperature</b><br>Identifies the temperature measured at servo 16. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 38                                    | <b>AV_Servo_17_Current</b><br>Identifies the current draw in amps for servo 17.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 39                                    | <b>AV_Servo_17_Temperature</b><br>Identifies the temperature measured at servo 17. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |

| AV Servo Status Message Message Field | Data Element Name & Description  | Data Type | Data Units         | Range Values    | Comments   |
|---------------------------------------|--|-----------|--------------------|-----------------|--|
| 40                                    | <b>AV_Servo_18_Current</b><br>Identifies the current draw in amps for servo 18.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 41                                    | <b>AV_Servo_18_Temperature</b><br>Identifies the temperature measured at servo 18. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 42                                    | <b>AV_Servo_19_Current</b><br>Identifies the current draw in amps for servo 19.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 43                                    | <b>AV_Servo_19_Temperature</b><br>Identifies the temperature measured at servo 19. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 44                                    | <b>AV_Servo_20_Current</b><br>Identifies the current draw in amps for servo 20.    | Double    | Amps               | 0 >= x >= 50    | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |
| 45                                    | <b>AV_Servo_20_Temperature</b><br>Identifies the temperature measured at servo 20. | Double    | Degrees Fahrenheit | -60 >= x >= 500 | Mapping to specific servos on the Air Vehicles is in the AV specific appendices. |

#### 4.2.5.2 TCS to DCM Messages

The messages in section 4.2.4.2 are transferred from the TCS to the DCM.

##### 4.2.5.2.1 AV Flight Mode Command Message

This message is 208 bytes long.

| AV Flight Mode Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values               | Comments   |
|--------------------------------------|--|-----------|------------|----------------------------|--|
| 1                                    | <b>Message_ID</b><br>Identifies the message being transmitted.                                       | Integer   | None       | 13                         |  |
| 2                                    | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.              | Integer   | None       | See AV Specific Appendices |  |
| 3                                    | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                     | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                                    | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                                    | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None       | 1 <= x <= 65535            |  |
| 6                                    | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None       | 0 <= x <= 1                | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |

| AV Flight Mode Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values         | Comments  |
|--------------------------------------|--|-----------|------------|----------------------|---|
| 7                                    | <b>AV_Flight_Mode</b><br>Commands the Air Vehicles current mode of control.  | Integer   | None       | 1 <= x <= 6          | 1 = Follow waypoints in current mission.<br>2 = Follow heading, airspeed, and altitude hold values.<br>3 = Fly to point specified by latitude, longitude, altitude, using best speed.<br>4 = Fly to point specified by latitude, longitude, altitude, using most fuel efficient speed.<br>5 = Fly to point specified by latitude, longitude, altitude, to arrive at specified time.<br>6 = Loiter at latitude, longitude, altitude. |
| 8                                    | <b>AV_Activate_New_Mission</b><br>Commands the Air Vehicle to set the mission identified in AV_New_Mission_ID as the current mission.        | Integer   | None       | 0 <= x <= 1          | 0 = Do not activate new mission.<br>1 = Activate new mission.   |
| 9                                    | <b>AV_New_Mission_ID</b><br>Identifies the mission to be set at the current mission.   | Integer   | None       | 0 <= x <= 65535      |   |
| 10                                   | <b>AV_Set_Altitude</b><br>Commands the Air Vehicle to maintain the altitude specified in AV_New_Altitude.                                    | Integer   | None       | 0 <= x <= 1          | 0 = Do not change the altitude the Air Vehicle is to maintain.<br>1 = Change the altitude the Air Vehicle is to maintain to AV_New_Altitude.  |
| 11                                   | <b>AV_New_Altitude</b><br>Specifies the altitude the Air Vehicle is commanded to maintain.   | Double    | Feet       | -2000 <= x <= 100000 | Altitude is above mean sea level.   |
| 12                                   | <b>AV_Set_Climb_Rate</b><br>Commands the Air Vehicle to use the climb rate specified in AV_New_Climb_Rate when changing commanded altitudes. | Integer   | None       | 0 <= x <= 1          | 0 = Do not change the climb rate the Air Vehicle is commanded to use.<br>1 = Change the climb rate the Air Vehicle is to use to AV_New_Climb_Rate.  |

| AV Flight Mode Command Message Field | Data Element Name & Description  | Data Type | Data Units      | Range Values       | Comments   |
|--------------------------------------|--|-----------|-----------------|--------------------|--|
| 13                                   | <b>AV_New_Climb_Rate</b><br>Specifies the climb rate the Air Vehicle is to use when changing commanded altitudes. If the Air Vehicle is descending it is commanded to maintain negative AV_New_Climb_Rate. | Double    | Feet Per Minute | -5000 <= x <= 5000 |  |
| 14                                   | <b>AV_Set_Airspeed</b><br>Commands the Air Vehicle to maintain the airspeed specified in AV_New_Airspeed   | Integer   | None            | 0 <= x <= 1        | 0 = Do not change the airspeed the Air Vehicle is to maintain.<br>1 = Change the airspeed the Air Vehicle is to maintain to AV_New_Airspeed.   |
| 15                                   | <b>AV_New_Airspeed</b><br>Specifies the airspeed the Air Vehicle is commanded to maintain.   | Double    | Knots           | 0 <= x <= 800      |  |
| 16                                   | <b>AV_New_Airspeed_Sensor</b><br>Commands which airspeed sensor the autopilot will use.  | Integer   | None            | 0 <= x <= 3        | 0 = Use current airspeed sensor selected.<br>1 = Airspeed sensor 1.<br>2 = Airspeed sensor 2.<br>3 = Air Vehicle automatically select between airspeed sensors.<br>See Air Vehicle specific appendices for mapping of values to sensors. |
| 17                                   | <b>AV_New_AOA_Sensor_Active</b><br>Commands which angle of attack sensor the autopilot will use.   | Integer   | None            | 0 <= x <= 3        | 0 = Use current angle of attack sensor.<br>1 = Angle of Attack sensor 1.<br>2 = Angle of Attack sensor 2.<br>See Air Vehicle specific appendices for mapping of values to sensors.   |
| 18                                   | <b>AV_Set_Heading</b><br>Commands the Air Vehicle to maintain the heading specified in AV_New_Heading  | Integer   | None            | 0 <= x <= 1        | 0 = Do not change the heading the Air Vehicle is to maintain.<br>1 = Change the heading the Air Vehicle is to maintain to AV_New_Heading.  |

| AV Flight Mode Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values         | Comments                  |
|--------------------------------------|--|-----------|------------|----------------------|---------------------------|
| 19                                   | <b>AV_New_Heading</b><br>Specifies the heading the Air Vehicle is commanded to maintain.                                       | Double    | Degrees    | 0 <= x < 360         | Referenced to true north. |
| 20                                   | <b>AV_Fly_To_Latitude</b><br>Specifies the latitude of the point the Air Vehicle is commanded to fly to.                       | Double    | Degrees    | -90 <= x <= 90       | Referenced to WGS 84.     |
| 21                                   | <b>AV_Fly_To_Longitude</b><br>Specifies the longitude of the point the Air Vehicle is commanded to fly to.                     | Double    | Degrees    | -180 < x <= 180      | Referenced to WGS 84.     |
| 22                                   | <b>AV_Fly_To_Altitude</b><br>Specifies the altitude above MSL the Air Vehicle is commanded to fly to.                          | Double    | Feet       | -3000 <= x <= 100000 | Referenced to WGS 84.     |
| 23                                   | <b>AV_Arrival_Time_Weeks</b><br>Specifies the commanded arrival time for the Air Vehicle at the commanded fly to point.        | Integer   | Weeks      | 0 <= x < 1024        | Standard GPS time format. |
| 24                                   | <b>AV_Arrival_Time_Second</b><br>Specifies the commanded arrival time for the Air Vehicle at the commanded fly to point.       | Integer   | Seconds    | 0 <= x < 604800      | Standard GPS time format. |
| 25                                   | <b>AV_Loiter_Latitude</b><br>Specifies the latitude of the center of the loiter pattern the Air Vehicle is commanded to fly.   | Double    | Degrees    | -90 <= x <= 90       | Referenced to WGS 84.     |
| 26                                   | <b>AV_Loiter_Longitude</b><br>Specifies the longitude of the center of the loiter pattern the Air Vehicle is commanded to fly. | Double    | Degrees    | -180 < x <= 180      | Referenced to WGS 84.     |
| 27                                   | <b>AV_Loiter_Altitude</b><br>Specifies the altitude above MSL of the loiter pattern the Air Vehicle is commanded to fly.       | Double    | Feet       | -3000 <= x <= 100000 | Referenced to WGS 84.     |

| AV Flight Mode Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values             | Comments   |
|--------------------------------------|---|-----------|------------|--------------------------|--|
| 28                                   | <b>AV_Loiter_Pattern</b><br>Specifies the loiter pattern the Air Vehicle is commanded to fly.   | Integer   | None       | $0 \leq x \leq 3$        | 0 = No loiter.<br>1 = Oval/Circle.<br>2 = Racetrack. This pattern is oriented so the straight sides are parallel to the width axis of the loiter box.<br>3 = Figure 8. This pattern is oriented so the top and bottom of the 8 touch the length sides of the loiter box. |
| 29                                   | <b>AV_Loiter_Length</b><br>Specifies the length of the box which outlines the loiter area. The loiter pattern will touch the edges of the box.  | Double    | Feet       | $500 \leq x \leq 500000$ |  |
| 30                                   | <b>AV_Loiter_Width</b><br>Specifies the width of the box which outlines the loiter area. The loiter pattern will touch the edges of the box.  | Double    | Feet       | $500 \leq x \leq 500000$ |  |
| 31                                   | <b>AV_Loiter_Orientation</b><br>Specifies the orientation of the box which outlines the loiter area. Orientation is defined as the angular difference between a line drawn parallel to the width dimension of the box and true north. | Double    | Degrees    | $0 \leq x < 360$         |  |
| 32                                   | <b>AV_Loiter_Time</b><br>Specifies the length of time for the Air Vehicle to maintain the loiter pattern.   | Integer   | Seconds    | $0 \leq x \leq 100000$   | 0 = Until next command.<br>If this message is not sent as part of a flight route plan, then the value of this field must be 0.   |
| 33                                   | <b>AV_Loiter_Loops</b><br>Specifies the number of loops to complete while flying the loiter pattern.  | Integer   | None       | $0 \leq x \leq 99$       | 0 = Until next command.<br>If this message is not sent as part of a flight route plan, then the value of this field must be 0.   |
| 34                                   | <b>AV_Loiter_Time_Or_Loops</b><br>Specifies whether the loiter time is specified in seconds by AV_Loiter_Time or in loops by AV_Loiter_Loops.   | Integer   | None       | $0 \leq x \leq 1$        | 0 = Time<br>1 = Loops  |

| AV Flight Mode Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values                                  | Comments  |
|--------------------------------------|--|-----------|------------|---|---|
| 35                                   | <b>AV_Set_Next_Waypoint</b><br>Commands the AV to jump forward or backward in the mission plan and set the waypoint specified in AV_New_Next_Waypoint as the current waypoint to fly to. | Integer   | None       | 0 <= x <= 1                                   | 0 = Do not modify next waypoint.<br>1 = Set next waypoint to AV_New_Next_Waypoint |
| 36                                   | <b>AV_New_Next_Waypoint</b><br>Specifies the waypoint to jump to in the mission plan.  | Integer   | None       | 0 <= x <= number waypoints in current mission | A value of 0 is illegal if AV_Set_Next_Waypoint = 1.                              |

#### 4.2.5.2.2 AV Flight Envelope Command Message

This message is 172 bytes long.

| AV Flight Envelope Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments                     |
|--|---|-----------|------------|----------------------------|------------------------------|
| 1  | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 14                         |                              |
| 2  | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |                              |
| 3  | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider |

| AV Flight Envelope<br>Command Message<br>Field | Data Element Name &<br>Description   | Data<br>Type | Data Units      | Range Values         | Comments  |
|--|--|--------------|-----------------|----------------------|---|
| 4  | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                                   | String       | None            | N/A                  | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5  | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.   | Integer      | None            | 1 <= x <= 65535      |   |
| 6  | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM.           | Integer      | None            | 0 <= x <= 1          | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.   |
| 7  | <b>AV_Min_Altitude_Above_MSL</b><br>Identifies the minimum altitude above mean sea level for the Air Vehicle.  | Double       | Feet            | -2000 <= x <= 100000 |   |
| 8  | <b>AV_Max_Altitude_Above_MSL</b><br>Identifies the maximum altitude above mean sea level for the Air Vehicle.  | Double       | Feet            | -2000 <= x <= 100000 |   |
| 9  | <b>AV_Min_Altitude_Above_Ground</b><br>Identifies the minimum altitude above ground level for the Air Vehicle. | Double       | Feet            | -2000 <= x <= 100000 |   |
| 10   | <b>AV_Max_Decent_Rate</b><br>Indicates the maximum decent rate for the Air Vehicle.                            | Double       | Feet Per Minute | 0 <= x <= 10000      |   |
| 11   | <b>AV_Max_Climb_Rate</b><br>Indicates the maximum climb rate for the Air Vehicle.                              | Double       | Feet Per Minute | 0 <= x <= 10000      |   |

| AV Flight Envelope Command Message Field | Data Element Name & Description   | Data Type | Data Units         | Range Values     | Comments |
|--|---|-----------|--------------------|------------------|----------|
| 12                                       | <b>AV_Min_Airspeed</b><br>Indicates the minimum airspeed to always be maintained by the Air Vehicle.                                | Double    | Knots              | 0 <= x <= 600    |          |
| 13                                       | <b>AV_Max_Airspeed</b><br>Indicates the airspeed to not be exceeded by the Air Vehicle.   | Double    | Knots              | 0 <= x <= 600    |          |
| 14                                       | <b>AV_Max_Positive_Acceleration</b><br>Indicates the positive acceleration not to be exceeded by the Air Vehicle during a maneuver. | Double    | G's                | 0 <= x <= 10     |          |
| 15                                       | <b>AV_Max_Negative_Acceleration</b><br>Indicates the negative acceleration not to be exceeded by the Air Vehicle during a maneuver. | Double    | G's                | -10 <= x <= 0    |          |
| 16                                       | <b>AV_Min_Angle_of_Attack</b><br>Indicates the minimum angle of attack for the Air Vehicle.   | Double    | Degrees            | -180 <= x <= 180 |          |
| 17                                       | <b>AV_Max_Angle_of_Attack</b><br>Indicates the maximum angle of attack for the Air Vehicle.   | Double    | Degrees            | -180 <= x <= 180 |          |
| 18                                       | <b>AV_Max_Pitch_Angle</b><br>Indicates the value that the absolute value of the Air Vehicle pitch shall not exceed.                 | Double    | Degrees            | 0 <= x <= 90     |          |
| 19                                       | <b>AV_Max_Pitch_Rate</b><br>Indicates the value that the absolute value of the Air Vehicle pitch rate shall not exceed.             | Double    | Degrees Per Second | 0 <= x <= 180    |          |
| 20                                       | <b>AV_Max_Roll_Angle</b><br>Indicates the value that the absolute value of the Air Vehicle roll shall not exceed.                   | Double    | Degrees            | 0 <= x <= 180    |          |
| 21                                       | <b>AV_Max_Roll_Rate</b><br>Indicates the value that the absolute value of the Air Vehicle roll rate shall not exceed.               | Double    | Degrees per Second | 0 <= x <= 180    |          |

| AV Flight Envelope Command Message Field | Data Element Name & Description   | Data Type | Data Units         | Range Values  | Comments |
|--|---|-----------|--------------------|---------------|----------|
| 22                                       | <b>AV_Max_Yaw_Rate</b><br>Indicates the value that the absolute value of the Air Vehicle yaw rate shall not exceed. | Double    | Degrees per Second | 0 <= x <= 180 |          |
| 23                                       | <b>AV_Max_Sideslip</b>  | Double    | TBD                | TBD           |          |

#### 4.2.5.2.3 AV Lights Command Message

This message is 64 bytes long.

| AV Lights Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments                     |
|---------------------------------|---|-----------|------------|----------------------------|------------------------------|
| 1                               | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 24                         |                              |
| 2                               | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |                              |
| 3                               | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider |

| AV Lights<br>Command Message<br>Field | Data Element Name &<br>Description   | Data<br>Type | Data Units     | Range Values    | Comments   |
|---------------------------------------|--|--------------|----------------|-----------------|--|
| 4                                     | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String       | None           | N/A             | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                                     | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer      | None           | 1 <= x <= 65535 |  |
| 6                                     | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer      | None           | 0 <= x <= 1     | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7                                     | <b>AV_Nav_Lights</b><br>Controls the navigation lights on the Air Vehicle.                           | Integer      | None           | 0 <= x <= 1     | 0 = Off<br>1 = On  |
| 8                                     | <b>AV_Strobe_Lights</b><br>Controls the Air Vehicle's strobe lights.                                 | Integer      | None           | 0 <= x <= 1     | 0 = Off<br>1 = On  |
| 9                                     | <b>AV_Landing_Lights</b><br>Controls the Air Vehicle's landing lights.                               | Integer      | None           | 0 <= x <= 1     | 0 = Off<br>1 = On  |
| 10                                    | <b>AV_Rad_Haz_Strobe</b><br>Controls the Air Vehicle's radiation hazard strobe light.                | Integer      | None           | 0 <= x <= 1     | 0 = Disabled<br>1 = Enabled  |
| 11                                    | <b>AV_Lights_Out_Range</b><br>Sets the Air Vehicle's lights out range from the GDT.                  | Double       | Nautical Miles | 0 <= x <= 255   |  |
| 12                                    | <b>AV_Lights_Out_Range_Enable</b><br>Enables the AV's automatic lights out range.                    | Integer      | None           | 0 <= x <= 1     | 0 = Disabled<br>1 = Enabled  |

#### 4.2.5.2.4 TCS Position Uplink Message

This message is 68 bytes long.

| TCS Position<br>Uplink Message<br>Field | Data Element Name &<br>Description   | Data<br>Type | Data Units | Range Values               | Comments   |
|---|--|--------------|------------|----------------------------|--|
| 1                                       | <b>Message_ID</b><br>Identifies the message being transmitted.                                       | Integer      | None       | 35                         |  |
| 2                                       | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.              | Integer      | None       | See AV Specific Appendices |  |
| 3                                       | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                     | Integer      | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                                       | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String       | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                                       | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer      | None       | 1 <= x <= 65535            |  |
| 6                                       | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer      | None       | 0 <= x <= 1                | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7                                       | <b>TCS_Latitude</b><br>Indicates the current latitude of the TCS.                                    | Double       | Degrees    | -90 <= x <= 90             | Positive value indicates North latitude.   |
| 8                                       | <b>TCS_Longitude</b><br>Indicates the current longitude of the TCS.                                  | Double       | Degrees    | -180 <= x <= 180           | Positive value indicates East longitude.   |

| TCS Position<br>Uplink Message<br>Field | Data Element Name &<br>Description  | Data<br>Type | Data Units | Range Values        | Comments                                 |
|---|---|--------------|------------|---------------------|--|
| 9                                       | <b>TCS_Altitude</b><br>Indicates the current altitude of the TCS above MSL.   | Double       | Feet       | -2000 <= x <= 20000 |  |
| 10                                      | <b>TCS_Magnetic_Variation</b><br>Indicates the magnetic variation at the TCS. | Double       | Degrees    | -90 <= x <= 90      | Positive value indicates east variation. |

#### 4.2.5.2.5 TCS Environmental Data Uplink Message

This message is 284 bytes long.

| TCS Environmental<br>Data Uplink<br>Message Field | Data Element Name &<br>Description  | Data<br>Type | Data Units | Range Values               | Comments                     |
|---|---|--------------|------------|----------------------------|------------------------------|
| 1   | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer      | None       | 27                         |                              |
| 2   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer      | None       | See AV Specific Appendices |                              |
| 3   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer      | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider |

| TCS Environmental Data Uplink Message Field | Data Element Name & Description  | Data Type | Data Units         | Range Values    | Comments  |
|---|--|-----------|--------------------|-----------------|---|
| 4   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String    | None               | N/A             | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4 byte string length element making the total field length 16 bytes. |
| 5   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None               | 1 <= x <= 65535 |   |
| 6   | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None               | 0 <= x <= 1     | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.   |
| 7   | <b>TCS_Barometric</b><br>Indicates the current barometric pressure at the TCS.                       | Double    | Inches Of Mercury  | 20 <= x <= 40   |   |
| 8   | <b>TCS_Air_Temperature</b><br>Indicates the current air temperature at the TCS.                      | Double    | Degrees Fahrenheit | -60 <= x <= 130 |   |
| 9   | <b>TCS_Wind_Speed_Surface</b><br>Indicates the current wind speed at the TCS.                        | Double    | Knots              | 0 <= x <= 80    |   |
| 10  | <b>TCS_Wind_Direction_Surface</b><br>Indicates the current direction the wind is blowing from.       | Double    | Degrees            | 0 <= x < 360    |   |
| 11  | <b>Fest_Wind_Speed_3000_Ft</b><br>Forecast wind speed at 3000 feet above MSL.                        | Double    | Knots              | 0 <= x <= 200   |   |

| <b>TCS Environmental Data Uplink Message Field</b> | <b>Data Element Name &amp; Description</b>  | <b>Data Type</b> | <b>Data Units</b>  | <b>Range Values</b>    | <b>Comments</b> |
|--|---|------------------|--------------------|------------------------|-----------------|
| <b>12</b>  | <b>Fest_Wind_Direction_3000_Ft</b><br>Forecast wind direction at 3000 feet above MSL.   | Double           | Degrees            | $0 \leq x < 360$       |                 |
| <b>13</b>  | <b>Fest_Air_Temp_3000_Ft</b><br>Forecast air temperature at 3000 feet above MSL.        | Double           | Degrees Fahrenheit | $-200 \leq x \leq 130$ |                 |
| <b>14</b>  | <b>Fest_Wind_Speed_6000_Ft</b><br>Forecast wind speed at 6000 feet above MSL.           | Double           | Knots              | $0 \leq x \leq 200$    |                 |
| <b>15</b>  | <b>Fest_Wind_Direction_6000_Ft</b><br>Forecast wind direction at 6000 feet above MSL.   | Double           | Degrees            | $0 \leq x < 360$       |                 |
| <b>16</b>  | <b>Fest_Air_Temp_6000_Ft</b><br>Forecast air temperature at 6000 feet above MSL.        | Double           | Degrees Fahrenheit | $-200 \leq x \leq 130$ |                 |
| <b>17</b>  | <b>Fest_Wind_Speed_9000_Ft</b><br>Forecast wind speed at 9000 feet above MSL.           | Double           | Knots              | $0 \leq x \leq 200$    |                 |
| <b>18</b>  | <b>Fest_Wind_Direction_9000_Ft</b><br>Forecast wind direction at 9000 feet above MSL.   | Double           | Degrees            | $0 \leq x < 360$       |                 |
| <b>19</b>  | <b>Fest_Air_Temp_9000_Ft</b><br>Forecast air temperature at 9000 feet above MSL.        | Double           | Degrees Fahrenheit | $-200 \leq x \leq 130$ |                 |
| <b>20</b>  | <b>Fest_Wind_Speed_12000_Ft</b><br>Forecast wind speed at 12000 feet above MSL.         | Double           | Knots              | $0 \leq x \leq 200$    |                 |
| <b>21</b>  | <b>Fest_Wind_Direction_12000_Ft</b><br>Forecast wind direction at 12000 feet above MSL. | Double           | Degrees            | $0 \leq x < 360$       |                 |
| <b>22</b>  | <b>Fest_Air_Temp_12000_Ft</b><br>Forecast air temperature at 12000 feet above MSL.      | Double           | Degrees Fahrenheit | $-200 \leq x \leq 130$ |                 |

| TCS Environmental Data Uplink Message Field | Data Element Name & Description   | Data Type | Data Units         | Range Values     | Comments |
|---|---|-----------|--------------------|------------------|----------|
| 23  | <b>Fest_Wind_Speed_18000_Ft</b><br>Forecast wind speed at 18000 feet above MSL.         | Double    | Knots              | 0 <= x <= 200    |          |
| 24  | <b>Fest_Wind_Direction_18000_Ft</b><br>Forecast wind direction at 18000 feet above MSL. | Double    | Degrees            | 0 <= x < 360     |          |
| 25  | <b>Fest_Air_Temp_18000_Ft</b><br>Forecast air temperature at 18000 feet above MSL.      | Double    | Degrees Fahrenheit | -200 <= x <= 130 |          |
| 26  | <b>Fest_Wind_Speed_24000_Ft</b><br>Forecast wind speed at 24000 feet above MSL.         | Double    | Knots              | 0 <= x <= 200    |          |
| 27  | <b>Fest_Wind_Direction_24000_Ft</b><br>Forecast wind direction at 24000 feet above MSL. | Double    | Degrees            | 0 <= x < 360     |          |
| 28  | <b>Fest_Air_Temp_24000_Ft</b><br>Forecast air temperature at 24000 feet above MSL.      | Double    | Degrees Fahrenheit | -200 <= x <= 130 |          |
| 29  | <b>Fest_Wind_Speed_30000_Ft</b><br>Forecast wind speed at 30000 feet above MSL.         | Double    | Knots              | 0 <= x <= 200    |          |
| 30  | <b>Fest_Wind_Direction_30000_Ft</b><br>Forecast wind direction at 30000 feet above MSL. | Double    | Degrees            | 0 <= x < 360     |          |
| 31  | <b>Fest_Air_Temp_30000_Ft</b><br>Forecast air temperature at 30000 feet above MSL.      | Double    | Degrees Fahrenheit | -200 <= x <= 130 |          |
| 32  | <b>Fest_Wind_Speed_34000_Ft</b><br>Forecast wind speed at 34000 feet above MSL.         | Double    | Knots              | 0 <= x <= 200    |          |

| TCS Environmental Data Uplink Message Field | Data Element Name & Description   | Data Type | Data Units         | Range Values     | Comments |
|---|---|-----------|--------------------|------------------|----------|
| 33  | <b>Fcst_Wind_Direction_34000_Ft</b><br>Forecast wind direction at 34000 feet above MSL. | Double    | Degrees            | 0 <= x < 360     |          |
| 34  | <b>Fcst_Air_Temp_34000_Ft</b><br>Forecast air temperature at 34000 feet above MSL.      | Double    | Degrees Fahrenheit | -200 <= x <= 130 |          |
| 35  | <b>Fcst_Wind_Speed_39000_Ft</b><br>Forecast wind speed at 39000 feet above MSL.         | Double    | Knots              | 0 <= x <= 200    |          |
| 36  | <b>Fcst_Wind_Direction_39000_Ft</b><br>Forecast wind direction at 39000 feet above MSL. | Double    | Degrees            | 0 <= x < 360     |          |
| 37  | <b>Fcst_Air_Temp_39000_Ft</b><br>Forecast air temperature at 39000 feet above MSL.      | Double    | Degrees Fahrenheit | -200 <= x <= 130 |          |

#### 4.2.5.2.6 EOIR Command Message

This message is 164 bytes long.

| EOIR Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments |
|----------------------------|---|-----------|------------|----------------------------|----------|
| 1                          | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 28                         |          |
| 2                          | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |          |

| EOIR Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values          | Comments   |
|----------------------------|--|-----------|------------|-----------------------|--|
| 3                          | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                     | Integer   | None       | $1 \leq x \leq 2$     | 1 = Predator<br>2 = Outrider   |
| 4                          | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String    | None       | N/A                   | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                          | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None       | $1 \leq x \leq 65535$ |  |
| 6                          | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None       | $0 \leq x \leq 1$     | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7                          | <b>EOIR_Identifier</b><br>Identifies the specific payload being commanded.                           | Integer   | None       | $1 \leq x \leq 2$     | 1 = POP 100<br>2 = Skyball   |
| 8                          | <b>EO_Power</b><br>Controls the Electro-optical payload's power status.                              | Integer   | None       | $0 \leq x \leq 1$     | 0 = Off<br>1 = On  |
| 9                          | <b>IR_Power</b><br>Controls the Infrared payload's power status.                                     | Integer   | None       | $0 \leq x \leq 1$     | 0 = Off<br>1 = On  |
| 10                         | <b>EOIR_Payload_Active</b><br>Controls which payload is currently active.                            | Integer   | None       | $0 \leq x \leq 2$     | 0 = None<br>1 = EO<br>2 = IR   |

| EOIR Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values         | Comments  |
|----------------------------|---|-----------|------------|----------------------|---|
| 11                         | <b>EOIR_Payload_Pointing_Mode</b><br>Controls the pointing mode of the payload.                 | Integer   | None       | 0 <= x <= 4          | 0 = Point at position given by EO/IR Pointer Latitude, EO/IR Pointer Longitude<br>1 = Point at EO/IR Azimuth, EO/IR Depression<br>2 = Auto track<br>3 = EOIR in waypoint control. This value is only allowed when the AV is currently in waypoint mode<br>4 = Rate Mode, EO/IR pointing position modified by EOIR_Azimuth_Rate and EOIR_Depression_Rate |
| 12                         | <b>EOIR_Pointer_Latitude</b><br>Commands the latitude of the EO/IR pointing position.           | Double    | Degrees    | -90 <= x <= 90       | Positive value indicates North latitude.<br>This field is only valid when EOIR_Payload_Pointing_Mode = 0 or 3.  |
| 13                         | <b>EOIR_Pointer_Longitude</b><br>Commands the longitude of the EO/IR pointing position.         | Double    | Degrees    | -180 < x <= 180      | Positive value indicates East longitude.<br>This field is only valid when EOIR_Payload_Pointing_Mode = 0 or 3.  |
| 14                         | <b>EOIR_Pointer_Altitude</b><br>Commands the altitude above MSL of the EO/IR pointing position. | Double    | Feet       | -3000 <= x <= 100000 | Referenced to WGS 84. This field is only valid when EOIR_Payload_Pointing_Mode = 0 or 3.  |
| 15                         | <b>EOIR_Depression</b><br>Controls the EO/IR pointing depression.                               | Double    | Degrees    | -90 <= x <= 120      | Positive value indicates down.<br>Depression is given in reference to the Air Vehicle. This field is only valid when EOIR_Payload_Pointing_Mode = 1.  |

| EOIR Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values     | Comments   |
|----------------------------|---|-----------|------------|------------------|--|
| 16                         | <b>EOIR_Azimuth</b><br>Controls the EO/IR pointing azimuth.   | Double    | Degrees    | 0 <= x < 360     | Azimuth is given in reference to the Air Vehicle with 0 parallel to the Air Vehicle's length axis. This field is only valid when EOIR_Payload_Pointing_Mode = 1.   |
| 17                         | <b>EOIR_Depression_Rate</b><br>Controls the EO/IR pointing depression angle change rate. This field represents the percent of control deflection. | Double 8  | Percent    | -100 <= x <= 100 | Positive values indicate increase in depression angle. The depression angle will continue to be modified at the specified rate as long as this field is not set to 0.<br>This field is only valid when EOIR_payload_Pointing_Mode = 4. |
| 18                         | <b>EOIR_Azimuth_Rate</b><br>Controls the EO/IR pointing azimuth change rate. This field represents the percent of control deflection.             | Double 8  | Percent    | -100 <= x <= 100 | Positive values indicate increase in azimuth. The azimuth will continue to be modified at the specified rate as long as this field is not set to 0.<br>This field is only valid when EOIR_payload_Pointing_Mode = 4.                   |
| 19                         | <b>EO_Payload_Camera_Select</b><br>Controls which EO camera is active.  | Integer   | None       | 0 <= x <= 3      | See AV Specific appendix for values.   |
| 20                         | <b>EO_Payload_Zoom</b><br>Controls the active EO camera's zoom setting.   | Double    | None       | 0 <= x <= 100    | 0 = Minimum zoom<br>100 = maximum zoom<br>The mapping between values and actual zoom settings shall be linear.   |
| 21                         | <b>EO_Payload_Focus</b><br>Controls the active EO camera's focus setting.   | Double    | None       | -1 <= x <= 100   | <0 = Auto-focus<br>0 = Closest focus setting.<br>100 = Longest focus setting.<br>The mapping between values and actual focus settings shall be linear.   |

| EOIR Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values   | Comments  |
|----------------------------|---|-----------|------------|----------------|---|
| 22                         | <b>EO_Iris</b><br>Controls the active EO camera's iris setting.           | Double    | None       | -1 <= x <= 100 | <0 = Auto-exposure<br>0 = Smallest iris setting.<br>100 = Largest iris setting.<br>The mapping between values and actual iris settings shall be linear.   |
| 23                         | <b>IR_Payload_Camera_Select</b><br>Controls which IR camera is active.    | Integer   | None       | 0 <= x <= 3    | See AV specific appendices for values.  |
| 24                         | <b>IR_Payload_Zoom</b><br>Controls the active IR camera's zoom setting.   | Double    | None       | 0 <= x <= 100  | 0 = Minimum zoom<br>100 = maximum zoom<br>The mapping between values and actual zoom settings shall be linear. If there are discrete settings for zoom, then they should be mapped linearly between 0 and 100 and the allowed range for this field should be discrete values. |
| 25                         | <b>IR_Payload_Focus</b><br>Controls the active IR camera's focus setting. | Double    | None       | -1 <= x <= 100 | <0 = Auto-focus<br>0 = Closest focus setting.<br>100 = Longest focus setting.<br>The mapping between values and actual focus settings shall be linear.  |
| 26                         | <b>IR_Contrast</b><br>Controls the active IR camera's contrast setting.   | Double    | None       | 0 <= x <= 100  | 0 = Minimum contrast.<br>100 = maximum contrast.<br>The mapping between values and actual iris settings shall be linear.  |
| 27                         | <b>IR_Gain</b><br>Controls the active IR camera's gain setting.           | Double    | None       | -1 <= x <= 100 | <0 = Auto-gain<br>0 = Lowest gain setting.<br>100 = Highest gain setting.<br>The mapping between values and actual gain settings shall be linear.   |

| EOIR Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values | Comments   |
|----------------------------|--|-----------|------------|--------------|--|
| 28                         | <b>IR_White_Hot</b><br>Controls if the active IR camera is white equals hot or black equals hot. | Integer   | None       | 0 <= x <= 1  | 0 = Black is hot.<br>1 = White is hot.   |
| 29                         | <b>IR_Auto_Gain_Recalibration</b><br>Commands the IR camera to recalibrate its base gain level.  | Integer 4 | None       | 0 <= x <= 1  | 0 = Continue normal operation.<br>1 = Recalibrate IR gain level.<br>This is a momentary command to the payload and shall not be held high for more than 1 message. |

#### 4.2.5.2.7 AV Analog Video Command Message

This message is 124 bytes long.

| AV Analog Video Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments                     |
|---------------------------------------|---|-----------|------------|----------------------------|------------------------------|
| 1                                     | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 22                         |                              |
| 2                                     | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |                              |
| 3                                     | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider |

| AV Analog Video Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values    | Comments   |
|---------------------------------------|--|-----------|------------|-----------------|--|
| 4                                     | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                                     | String    | None       | N/A             | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                                     | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.   | Integer   | None       | 1 <= x <= 65535 |  |
| 6                                     | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM.             | Integer   | None       | 0 <= x <= 1     | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7                                     | <b>AV_Video_Mux_Power</b><br>Indicates if power is applied to the AV's video distribution MUX.                   | Integer   | None       | 0 <= x <= 1     | 0 = Off<br>1 = On  |
| 8                                     | <b>AV_Video_Downlink_Ch_1_Source</b><br>Commands the video source routed to the channel 1 of the video downlink. | Integer   | None       | 0 <= x <= 10    | 0 = None<br>For other values see AV specific appendices  |
| 9                                     | <b>AV_Video_Downlink_Ch_2_Source</b><br>Commands the video source routed to the channel 2 of the video downlink. | Integer   | None       | 0 <= x <= 10    | 0 = None<br>For other values see AV specific appendices  |
| 10                                    | <b>AV_Video_Downlink_Ch_3_Source</b><br>Commands the video source routed to the channel 3 of the video downlink. | Integer   | None       | 0 <= x <= 10    | 0 = None<br>For other values see AV specific appendices  |
| 11                                    | <b>AV_Video_Downlink_Ch_4_Source</b><br>Commands the video source routed to the channel 4 of the video downlink. | Integer   | None       | 0 <= x <= 10    | 0 = None<br>For other values see AV specific appendices  |

| AV Analog Video Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values | Comments  |
|---------------------------------------|---|-----------|------------|--------------|---|
| 12                                    | <b>AV_VCR_Power_1</b><br>Commands the Air Vehicle's VCR 1 power status.   | Integer   | None       | 0 <= x <= 1  | 0 = Off<br>1 = On   |
| 13                                    | <b>AV_VCR_Mode_1</b><br>Commands the current operating mode of the Air Vehicle's VCR 1.                               | Integer   | None       | 0 <= x <= 5  | 0 = Eject<br>1 = Stop<br>2 = Fast Forward<br>3 = Rewind<br>4 = Play<br>5 = Record<br>6 = Rewind Search<br>7 = Fast Forward Search |
| 14                                    | <b>AV_VCR_Counter_Reset_1</b><br>Commands the Air Vehicle's VCR 1 to reset its tape counter to 0.                     | Integer   | None       | 0 <= x <= 1  | 0 = Do not reset counter<br>1 = Reset counter   |
| 15                                    | <b>AV_VCR_Record_Source_1</b><br>Indicates the video source currently routed to the AV's VCR 1 by the AV's video MUX. | Integer   | None       | 0 <= x <= 10 | 0 = None<br>For other values see AV specific appendices   |
| 16                                    | <b>AV_VCR_Power_2</b><br>Commands the Air Vehicle's VCR 2 power status.   | Integer   | None       | 0 <= x <= 1  | 0 = Off<br>1 = On   |
| 17                                    | <b>AV_VCR_Mode_2</b><br>Commands the current operating mode of the Air Vehicle's VCR 2.                               | Integer   | None       | 0 <= x <= 5  | 0 = Eject<br>1 = Stop<br>2 = Fast Forward<br>3 = Rewind<br>4 = Play<br>5 = Record<br>6 = Rewind Search<br>7 = Fast Forward Search |
| 18                                    | <b>AV_VCR_Counter_Reset_2</b><br>Commands the Air Vehicle's VCR 2 to reset its tape counter to 0.                     | Integer   | None       | 0 <= x <= 1  | 0 = Do not reset counter<br>1 = Reset counter   |

| AV Analog Video Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values | Comments  |
|---------------------------------------|---|-----------|------------|--------------|---|
| <b>19</b>                             | <b>AV_VCR_Record_Source_2</b><br>Indicates the video source currently routed to the AV's VCR 2 by the AV's video MUX. | Integer   | None       | 0 <= x <= 10 | 0 = None<br>For other values see AV specific appendices   |
| <b>20</b>                             | <b>AV_VCR_Power_3</b><br>Commands the Air Vehicle's VCR 3 power status.   | Integer   | None       | 0 <= x <= 1  | 0 = Off<br>1 = On   |
| <b>21</b>                             | <b>AV_VCR_Mode_3</b><br>Commands the current operating mode of the Air Vehicle's VCR 3.                               | Integer   | None       | 0 <= x <= 5  | 0 = Eject<br>1 = Stop<br>2 = Fast Forward<br>3 = Rewind<br>4 = Play<br>5 = Record<br>6 = Rewind Search<br>7 = Fast Forward Search |
| <b>22</b>                             | <b>AV_VCR_Counter_Reset_3</b><br>Commands the Air Vehicle's VCR 3 to reset its tape counter to 0.                     | Integer   | None       | 0 <= x <= 1  | 0 = Do not reset counter<br>1 = Reset counter   |
| <b>23</b>                             | <b>AV_VCR_Record_Source_3</b><br>Indicates the video source currently routed to the AV's VCR 3 by the AV's video MUX. | Integer   | None       | 0 <= x <= 10 | 0 = None<br>For other values see AV specific appendices   |
| <b>24</b>                             | <b>AV_VCR_Power_4</b><br>Commands the Air Vehicle's VCR 4 power status.   | Integer   | None       | 0 <= x <= 1  | 0 = Off<br>1 = On   |
| <b>25</b>                             | <b>AV_VCR_Mode_4</b><br>Commands the current operating mode of the Air Vehicle's VCR 4.                               | Integer   | None       | 0 <= x <= 5  | 0 = Eject<br>1 = Stop<br>2 = Fast Forward<br>3 = Rewind<br>4 = Play<br>5 = Record<br>6 = Rewind Search<br>7 = Fast Forward Search |

| AV Analog Video Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values | Comments  |
|---------------------------------------|--|-----------|------------|--------------|---|
| 26                                    | <b>AV_VCR_Counter_Reset_4</b><br>Commands the Air Vehicle's VCR 4to reset its tape counter to 0.                     | Integer   | None       | 0 <= x <= 1  | 0 = Do not reset counter<br>1 = Reset counter           |
| 27                                    | <b>AV_VCR_Record_Source_4</b><br>Commands the video source currently routed to the AV's VCR 4 by the AV's video MUX. | Integer   | None       | 0 <= x <= 10 | 0 = None<br>For other values see AV specific appendices |
| 28                                    | <b>AV_Nose_Camera_Lens_Heater</b><br>Commands the AV's nose camera lens heater to operate                            | Integer   | None       | 0 <= x <= 1  | 0 = Off<br>1 = On                                       |

#### 4.2.5.2.8 AV Waypoint Begin Message

This message is used to delimit the beginning of a waypoint to be sent to the DCM to be translated to the Air Vehicle's specific flight route plan format. Waypoints are represented as a set of command messages that are grouped by AV Waypoint Begin messages. As a minimum, a waypoint shall contain an AV Flight Mode Command Message. To prevent a flight route plan transfer from locking out other commands from being transferred from the TCS to the DCM, the TCS shall transmit not more than 5 waypoints per second.

This message is 80 bytes long.

| AV Waypoint Begin Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments |
|---------------------------------|---|-----------|------------|----------------------------|----------|
| 1                               | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 33                         |          |
| 2                               | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |          |

| AV Waypoint Begin Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values    | Comments   |
|---------------------------------|--|-----------|------------|-----------------|--|
| 3                               | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.   | Integer   | None       | 1 <= x <= 2     | 1 = Predator<br>2 = Outrider   |
| 4                               | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.   | String    | None       | N/A             | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                               | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.   | Integer   | None       | 1 <= x <= 65535 |  |
| 6                               | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM.   | Integer   | None       | 0 <= x <= 1     | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7                               | <b>AV_Flight_Route_Plan_ID</b><br>Identifies the flight route plan being uploaded.   | Integer   | None       | 1 <= x <= 8000  | <= 4000 indicates normal flight route plan<br>> 4000 indicates emergency flight route plan   |
| 8                               | <b>AV_Waypoint_Number</b><br>Indicates the number of this waypoint. Waypoints are numbered sequentially beginning with 1.  | Integer   | None       | 1 <= x <= 999   |  |
| 9                               | <b>AV_Number_Waypoints_In_Plan</b><br>Indicates the number of waypoints in the plan being uploaded.  | Integer   | Waypoints  | 1 <= x <= 999   |  |
| 10                              | <b>AV_Number_Commands_In_Waypoint</b><br>Indicates the total number of command messages in this waypoint. The number of command messages does not include the AV Waypoint Begin Message. | Integer   | Messages   | 1 <= x <= 20    |  |

| AV Waypoint Begin Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values     | Comments   |
|---------------------------------|--|-----------|------------|------------------|--|
| 11                              | <b>AV_Waypoint_Emergency_Action</b><br>Indicates the action to be taken when a loss of link condition occurs.  | Integer   | None       | 0 <= x <= 4      | 0 = Continue to next waypoint.<br>1 = Follow flight route in reverse order.<br>2 = Immediately Activate emergency plan identified in field AV_Emergency_Plan_ID_1.<br>3 = Activate emergency plan identified in field AV_Emergency_Plan_ID_1 after a delay of AV_Emergency_Plan_Delay seconds.<br>4 = Initiate conditional emergency plan selection. |
| 12                              | <b>AV_Emergency_Plan_Delay</b><br>Indicates the number of seconds the AV should follow the normal flight route plan after a loss of link condition occurs. | Integer   | Seconds    | 0 <= x <= 3600   |  |
| 13                              | <b>AV_Emergency_Plan_Conditional_Select_Mode</b><br>The functionality of this field is TBD.  | Integer   | None       | 0                |  |
| 14                              | <b>AV_Emergency_Plan_ID_1</b><br>Indicates the AV_Flight_Route_Plan_ID of the flight route plan to follow when activated.                                  | Integer   | None       | 4000 < x <= 8000 | Used for conditional emergency plan selection only.  |
| 15                              | <b>AV_Emergency_Plan_ID_2</b><br>Indicates the AV_Flight_Route_Plan_ID of the flight route plan to follow when activated.                                  | Integer   | None       | 4000 < x <= 8000 | Used for conditional emergency plan selection only.  |
| 16                              | <b>AV_Emergency_Plan_ID_3</b><br>Indicates the AV_Flight_Route_Plan_ID of the flight route plan to follow when activated.                                  | Integer   | None       | 4000 < x <= 8000 | Used for conditional emergency plan selection only.  |
| 17                              | <b>AV_Emergency_Plan_ID_4</b><br>Indicates the AV_Flight_Route_Plan_ID of the flight route plan to follow when activated.                                  | Integer   | None       | 4000 < x <= 8000 | Used for conditional emergency plan selection only.  |

#### 4.2.5.2.9 AV Piston Engine Command Message

This message is 68 bytes long.

| AV Piston Engine Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values               | Comments   |
|--|--|-----------|------------|----------------------------|--|
| 1                                      | <b>Message_ID</b><br>Identifies the message being transmitted.                                       | Integer   | None       | 25                         |  |
| 2                                      | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.              | Integer   | None       | See AV Specific Appendices |  |
| 3                                      | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                     | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                                      | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                                      | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None       | 1 <= x <= 65535            |  |
| 6                                      | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None       | 0 <= x <= 1                | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7                                      | <b>Engine_ID</b><br>Identifies the engine commanded in this message.                                 | Integer   | None       | 1 <= x <= 2                | 1 = Forward or Starboard Engine<br>2 = Aft or Port Engine  |

| AV Piston Engine Command Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values    | Comments  |
|--|---|-----------|------------|-----------------|---|
| 8                                      | <b>Engine_Speed_Hold</b><br>Commands the engine to hold the RPM setting commanded in Engine_Speed field.                                      | Integer   | None       | 0 <= x <= 1     | 0 = Engine speed commanded by autopilot.<br>1 = Engine speed hold enabled.                            |
| 9                                      | <b>Engine_Speed</b><br>Commands the engine speed if the engine speed hold is enabled.   | Integer   | RPM        | 0 <= x <= 12000 | 0 = Idle  |
| 10                                     | <b>Engine_Start</b><br>Commands the engine to start.  | Integer   | None       | 0 <= x <= 1     | 0 = Continue in current run/stop state<br>1 = Start engine  |
| 11                                     | <b>Engine_Enable_Toggle</b><br>Commands the engine to change between enabled and disabled states. The engine must be enabled to start or run. | Integer   | None       | 0 <= x <= 2     | 0 = Continue in current enable/disable state<br>1 = Enable engine<br>2 = Disable engine               |
| 12                                     | <b>Engine_Cooling_Fan</b><br>Commands the current operating mode of the engine cooling fan.   | Integer   | None       | 0 <= x <= 2     | 0 = Off, manual<br>1 = On, manual<br>2 = Automatic  |
| 13                                     | <b>Engine_Ignition_Coil_1_Enable</b><br>Commands the engine to enable or disable ignition coil 1.   | Integer   | None       | 0 <= x <= 2     | 0 = Continue in current enable/disable state<br>1 = Enable ignition coil<br>2 = Disable ignition coil |
| 14                                     | <b>Engine_Ignition_Coil_2_Enable</b><br>Commands the engine to enable or disable ignition coil 2.   | Integer   | None       | 0 <= x <= 2     | 0 = Continue in current enable/disable state<br>1 = Enable ignition coil<br>2 = Disable ignition coil |

#### 4.2.5.2.10 AV IFF Command Message

This message is 80 bytes long.

| AV IFF Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values               | Comments   |
|------------------------------|--|-----------|------------|----------------------------|--|
| 1                            | <b>Message_ID</b><br>Identifies the message being transmitted.                                       | Integer   | None       | 26                         |  |
| 2                            | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.              | Integer   | None       | See AV Specific Appendices |  |
| 3                            | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                     | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                            | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                            | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None       | 1 <= x <= 65535            |  |
| 6                            | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None       | 0 <= x <= 1                | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7                            | <b>AVIFF_Power</b><br>Commands power to be applied to the Air Vehicle's IFF.                         | Integer   | None       | 0 <= x <= 1                | 0 = Off<br>1 = On  |
| 8                            | <b>AVIFF_Mode_C_Enable</b><br>Commands the Air Vehicle's IFF Mode C capability to be enabled.        | Integer   | None       | 0 <= x <= 1                | 0 = Mode C disabled<br>1 = Mode C enabled  |

| AV IFF Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values   | Comments   |
|------------------------------|--|-----------|------------|----------------|--|
| 9                            | <b>AV_IFF_Mode_1_Code</b><br>Commands the code for the IFF to squawk.                            | Integer   | None       | 1 <= x <= 4096 |  |
| 10                           | <b>AV_IFF_Mode_1_Enable</b><br>Commands the Air Vehicle's IFF Mode 1 capability to be enabled.   | Integer   | None       | 0 <= x <= 1    | 0 = Mode 1 disabled<br>1 = Mode 1 enabled          |
| 11                           | <b>AV_IFF_Mode_2_Enable</b><br>Commands the Air Vehicle's IFF Mode 2 capability to be enabled.   | Integer   | None       | 0 <= x <= 1    | 0 = Mode 2 disabled<br>1 = Mode 2 enabled          |
| 12                           | <b>AV_IFF_Mode_3A_Code</b><br>Commands the code for the IFF to squawk.                           | Integer   | None       | 1 <= x <= 4096 | This value is the decimal value of the octal code. |
| 13                           | <b>AV_IFF_Mode_3A_Enable</b><br>Commands the Air Vehicle's IFF Mode 3A capability to be enabled. | Integer   | None       | 0 <= x <= 1    | 0 = Mode 3A disabled<br>1 = Mode 3A enabled        |
| 14                           | <b>AV_IFF_Mode_4_Code</b><br>Commands the code for the IFF to squawk.                            | Integer   | None       | 1 <= x <= 4096 |  |
| 15                           | <b>AV_IFF_Mode_4_Hold_No_Hold</b>  | Integer   | None       | 0 <= x <= 1    | 0 = No hold<br>1 = Hold                            |
| 16                           | <b>AV_IFF_Mode_4_Off_On</b><br>Commands the Air Vehicle's IFF Mode 4 capability to be enabled.   | Integer   | None       | 0 <= x <= 1    | 0 = Mode 4 disabled<br>1 = Mode 4 enabled          |
| 17                           | <b>AV_IFF_Operational_Mode</b><br>Commands the operational mode of the IFF.                      | Integer   | None       | 1 <= x <= 3    | 1 = Standby<br>2 = Normal<br>3 = Emergency         |

#### 4.2.5.2.11 AV Fuel System Command Message

The length of this message is 72 bytes. This command is sent to the fuel tank identified in the Fuel\_Tank\_ID field.

| AV Fuel System Command Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values               | Comments   |
|--------------------------------------|--|-----------|------------|----------------------------|--|
| 1                                    | <b>Message_ID</b><br>Identifies the message being transmitted.                                       | Integer   | None       | 23                         |  |
| 2                                    | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.              | Integer   | None       | See AV Specific Appendices |  |
| 3                                    | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                     | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4                                    | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5                                    | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None       | 1 <= x <= 65535            |  |
| 6                                    | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None       | 0 <= x <= 1                | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7                                    | <b>Fuel_Tank_ID</b><br>Identifies the fuel tank being commanded by this command message.             | Integer   | None       | 1 <= x <= 4                | See AV Specific Appendices for definition of values.   |

| AV Fuel System Command Message Field | Data Element Name & Description  | Data Type | Data Units        | Range Values   | Comments  |
|--------------------------------------|--|-----------|-------------------|----------------|---|
| 8                                    | <b>AV_Engine_1_Fuel_Source_Tank</b><br>Commands this tank to provide fuel to engine 1.                                   | Integer   | None              | 0 <= x <= 2    | 0 = Do not provide fuel.<br>1 = Provide fuel to engine 1.<br>2 = Automatic. Allow AV to select which tank(s) to use. Multiple tanks can be commanded to provide fuel to 1 engine by using multiple AV Fuel System Command Messages. |
| 9                                    | <b>AV_Engine_2_Fuel_Source_Tank</b><br>Commands this tank to provide fuel to engine 2.                                   | Integer   | None              | 0 <= x <= 2    | 0 = Do not provide fuel.<br>1 = Provide fuel to engine 1.<br>2 = Automatic. Allow AV to select which tank(s) to use. Multiple tanks can be commanded to provide fuel to 1 engine by using multiple AV Fuel System Command Messages. |
| 10                                   | <b>AV_Fuel_Tank_Transfer_Rate</b><br>Commands the flow rate for transfer of fuel from one tank to another.               | Double    | Pounds Per Minute | 0 <= x <= 1000 |   |
| 11                                   | <b>AV_Fuel_Transfer_Source_Tank</b><br>Commands which tank to transfer fuel from.  | Integer   | None              | 0 <= x <= 4    | See AV Specific Appendices for definition of values.  |
| 12                                   | <b>AV_Fuel_Transfer_Destination_Tank</b><br>Commands which tank to transfer fuel to.                                     | Integer   | None              | 0 <= x <= 4    | See AV Specific Appendices for definition of values.  |
| 13                                   | <b>AV_Fuel_Start_Of_Flight</b><br>Tells the Air Vehicle how much fuel was loaded in this tank before the flight started. | Double    | Pounds            | 0 <= x <= 1000 | This field shall only be used before the Air Vehicle's engine is started for the flight. At all other times this field shall be set to 0. The DCM shall ignore this field if it is set to 0.  |

#### 4.2.5.2.12 Ground Line of Sight Datalink Command Message

This message is for the control of Air Vehicle's native GDT.

The length of this message is 108 bytes.

| Ground Line of Sight Datalink Control Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments   |
|---|---|-----------|------------|----------------------------|--|
| 1   | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 29                         |  |
| 2   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |  |
| 3   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.            | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |

| Ground Line of Sight Datalink Control Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values       | Comments   |
|---|--|-----------|------------|--------------------|--|
| 5   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None       | 1 <= x <= 65535    |  |
| 6   | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None       | 0 <= x <= 1        | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.      |
| 7   | <b>LOS_GDT_Uplink_Power_1</b><br>Commands the transmit power for transmitter 1.                      | Integer   | Watts      | 0 <= x <= 1000     | 0 = Not transmitting, Standby.   |
| 8   | <b>LOS_GDT_Uplink_Power_2</b><br>Commands the transmit power for transmitter 2.                      | Integer   | Watts      | 0 <= x <= 1000     | 0 = Not transmitting, Standby.   |
| 9   | <b>LOS_GDT_Uplink_Frequency_1</b><br>Commands the transmit frequency for transmitter 1.              | Double    | Megahertz  | 4400 <= x <= 18000 |  |
| 10  | <b>LOS_GDT_Uplink_Frequency_2</b><br>Commands the transmit frequency for transmitter 2.              | Double    | Megahertz  | 4400 <= x <= 18000 |  |
| 11  | <b>LOS_GDT_Downlink_Frequency_1</b><br>Commands the transmit frequency for receiver 1.               | Double    | Megahertz  | 4400 <= x <= 18000 |  |
| 12  | <b>LOS_GDT_Downlink_Frequency_2</b><br>Commands the transmit frequency for receiver 2.               | Double    | Megahertz  | 4400 <= x <= 18000 |  |
| 13  | <b>LOS_GDT_Transmitter_Selected</b><br>Commands the transmitter currently selected for uplink data.  | Integer   | None       | 0 <= x <= 2        | 0 = No transmitter selected.<br>1 = Transmitter 1 is primary.<br>2 = Transmitter 2 is primary. |
| 14  | <b>LOS_GDT_Cooling_Mode</b><br>Commands the current mode of operation of the GDT's cooling system.   | Integer   | None       | 0 <= x <= 2        | 0 = Off.<br>1 = On, manual.<br>2 = Automatic.  |

| Ground Line of Sight Datalink Control Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values   | Comments  |
|---|---|-----------|------------|----------------|---|
| 15  | <b>LOS_GDT_Power</b><br>Commands the input power to be applied to the GDT's transmitters.         | Integer   | None       | 0 <= x <= 1    | 0 = Off.<br>1 = On.   |
| 16  | <b>LOS_GDT_Transmit_Antenna_Select</b><br>Commands which antenna the GDT is transmitting through. | Integer   | None       | 0 <= x <= 4    | 0 = Dummy load.<br>1 = Omnidirectional.<br>2 = Directional.<br>3 = Omnidirectional and Directional.<br>4 = Auto select.                             |
| 17  | <b>LOS_GDT_Receive_Antenna_Select</b><br>Commands which antenna the GDT is receiving with.        | Integer   | None       | 0 <= x <= 3    | 0 = Omnidirectional.<br>1 = Directional.<br>2 = Omnidirectional and Directional.<br>3 = Auto select.  |
| 18  | <b>LOS_GDT_Tracking_Mode</b><br>Commands the method of antenna pointing to use.                   | Integer   | None       | 0 <= x <= 3    | 0 = Manual pointing by GDT operator.<br>1 = Monopulse tracking.<br>2 = Pointing commands from the TCS.<br>3 = Automated acquisition search pattern. |
| 19  | <b>LOS_GDT_Pointing_Azimuth</b><br>Commands the pointing azimuth for the directional antenna.     | Integer   | None       | 0 <= x <= 360  | Referenced to true North.   |
| 20  | <b>LOS_GDT_Pointing_Elevation</b><br>Commands the pointing elevation for the directional antenna. | Integer   | None       | -90 <= x <= 90 | Referenced to horizontal with positive up.  |

#### 4.2.5.2.13 Airborne Line of Sight Datalink Command Message

The length of this message is 116 bytes.

| Airborne Line of Sight Datalink Control Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values               | Comments   |
|---|--|-----------|------------|----------------------------|--|
| 1   | <b>Message_ID</b><br>Identifies the message being transmitted.                                       | Integer   | None       | 30                         |  |
| 2   | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by.              | Integer   | None       | See AV Specific Appendices |  |
| 3   | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                                     | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider   |
| 4   | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String    | None       | N/A                        | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5   | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None       | 1 <= x <= 65535            |  |
| 6   | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None       | 0 <= x <= 1                | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
| 7   | <b>AV_LOS_Ch_1_Uplink_Freq</b><br>Commands the current frequency for ADT receiver 1.                 | Double    | Megahertz  | 4400 <= x <= 18000         |  |
| 8   | <b>AV_LOS_Ch_2_Uplink_Freq</b><br>Commands the current frequency for ADT receiver 2.                 | Double    | Megahertz  | 4400 <= x <= 18000         |  |

| Airborne Line of Sight Datalink Control Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values       | Comments  |
|---|---|-----------|------------|--------------------|---|
| <b>9</b>  | <b>AV_LOS_Ch_1_Downlink_Freq</b><br>Commands the current frequency for ADT transmitter 1.                                     | Double    | Megahertz  | 4400 <= x <= 18000 |   |
| <b>10</b>   | <b>AV_LOS_Ch_2_Downlink_Freq</b><br>Commands the current frequency for ADT transmitter 2.                                     | Double    | Megahertz  | 4400 <= x <= 18000 |   |
| <b>11</b>   | <b>AV_LOS_ADT_Antenna_Selected</b><br>Commands the antenna(s) currently being used by the AV for the Line Of Sight data link. | Integer   | None       | 0 <= x <= 8        | 0 = None<br>1 = Omni 1<br>2 = Omni 2<br>3 = Omni 1 and Omni 2<br>4 = Directional<br>5 = Directional and Omni 1<br>6 = Directional and Omni 2<br>7 = Directional, Omni 1, and Omni 2<br>8 = Auto select. |
| <b>12</b>   | <b>AV_LOS_ADT_Pointing_Mode</b><br>Commands the pointing mode of the LOS directional antenna.                                 | Integer   | None       |                    | 0 = Automatic by signal strength.<br>1 = AV directed derived from GPS/INS position.<br>2 = Commanded by TCS.  |
| <b>13</b>   | <b>AV_LOS_Pointing_Azimuth</b><br>Indicates the pointing azimuth of the antenna relative to true north.                       | Double    | None       | 0 <= x <= 360      | Referenced to true North.   |
| <b>14</b>   | <b>AV_LOS_Pointing_Elevation</b><br>Indicates the pointing elevation of the antenna relative to the local horizontal.         | Double    | None       | -90 <= x <= 90     | Positive value indicates up.  |
| <b>15</b>   | <b>AV_LOS_ADT_Transmitter_1_Mode</b><br>Commands the operating mode of ADT transmitter 1.                                     | Integer   | None       | 0 <= x <= 2        | 0 = Off.<br>1 = Standby.<br>2 = Transmitting.   |

| Airborne Line of Sight Datalink Control Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values   | Comments                                      |
|---|---|-----------|------------|----------------|---|
| 16  | <b>AV_LOS_ADT_Transmitter_2_Mode</b><br>Commands the operating mode of ADT transmitter 2. | Integer   | None       | 0 <= x <= 2    | 0 = Off.<br>1 = Standby.<br>2 = Transmitting. |
| 17  | <b>AV_LOS_ADT_Tx_1_Power</b><br>Commands the transmission power for ADT transmitter 1.    | Double    | Watts      | 0 <= x <= 1000 |   |
| 18  | <b>AV_LOS_ADT_Tx_2_Power</b><br>Commands the transmission power for ADT transmitter 2.    | Double    | Watts      | 0 <= x <= 1000 |   |

#### 4.2.5.2.14 Airborne SATCOM Datalink Command Message

The length of this message is TBD bytes.

| Airborne SATCOM Datalink Control Message Field | Data Element Name & Description   | Data Type | Data Units | Range Values               | Comments                     |
|--|---|-----------|------------|----------------------------|------------------------------|
| 1  | <b>Message_ID</b><br>Identifies the message being transmitted.                          | Integer   | None       | 31                         |                              |
| 2  | <b>Message_Version</b><br>Identifies the version of the IDD this message is defined by. | Integer   | None       | See AV Specific Appendices |                              |
| 3  | <b>AV_Type</b><br>Identifies the Air Vehicle that TCS is flying.                        | Integer   | None       | 1 <= x <= 2                | 1 = Predator<br>2 = Outrider |

| Airborne SATCOM Datalink Control Message Field | Data Element Name & Description  | Data Type | Data Units | Range Values          | Comments   |
|--|--|-----------|------------|-----------------------|--|
| 4  | <b>AV_Tail_Number</b><br>Identifies the specific Air Vehicle that is flying.                         | String    | None       | N/A                   | This field contains the alphanumeric tail number of the air vehicle. It shall always be a 12 character fixed length string with the tail number in ASCII format left justified. Unused character positions shall be space filled. Note that the XDR String data type includes a 4-byte string length element making the total field length 16 bytes. |
| 5  | <b>Mission_ID</b><br>Identifies the Mission the Air Vehicle is flying.                               | Integer   | None       | $1 \leq x \leq 65535$ |  |
| 6  | <b>Mission_Command</b><br>Indicates if this message is part of a mission plan being sent to the DCM. | Integer   | None       | $0 \leq x \leq 1$     | 0 = Command to be acted on immediately by the Air Vehicle.<br>1 = Part of a mission plan.  |
|  | <b>The content of this message is TBD.</b>   |           |            |                       |  |

#### **4.2.6 Mission Plans**

Mission plans are transferred from the TCS RTP to the DCMs in an air vehicle independent format. The DCMs will then translate these mission plans to the air vehicle specific formats to be forwarded to the air vehicles for execution.

Mission plans shall be represented in a Fly-To format. That is, the air vehicle will execute any commands or actions associated with a waypoint when the air vehicle begins to proceed to that waypoint.

Mission plans consist of a consecutively numbered series of waypoints beginning with waypoint 1. Mission plans shall only be transferred in their entirety. The transfer of partial mission plans from the TCS RTP to the DCMs is not supported.

The same command messages used to command the air vehicles in real time are used to represent mission plans. Each command message contains a Mission\_Command field. A waypoint is merely a collection of one or more command messages which are to be executed at a given location and/or time. Waypoints are delineated by the AV Waypoint Begin message. Each AV Waypoint begin message indicates the number of command messages included in that waypoint. Waypoints, as a minimum, shall consist of an AV Waypoint Begin Message and an AV Flight Mode Command message. Fields within the AV Flight Mode Command message are used as the triggers to indicate when and where a waypoint shall be executed. A waypoint may also include any other air vehicle command messages.

The Mission\_Command field shall be set to 1 for any command that is a part of a mission plan. For all other uses, the Mission\_Command field shall be set to 0. Use of the Mission\_Command field allows mission plans to be transferred to the DCMs while normal air vehicle command messages are being used to command the air vehicle.

Waypoints shall be transferred to the air vehicle in ascending order, beginning with waypoint 1. The receipt of an AV Waypoint Begin message with the AV\_Waypoint\_Number field set to 1 shall reset all error handling statuses in a DCM associated with mission plan transfers.

The DCM shall store any mission plan currently active until a new mission plan has been successfully received from the TCS RTP, validated if necessary, and successfully forwarded to the air vehicle.

The DCM shall send a DCM Mission Load Acknowledge message to the TCS RTP within 10 seconds of the successful receipt and validation of a mission plan.

If the DCM receives waypoints out of order, it shall generate a DCM Mission Load Acknowledge message indicating such and shall discard any portion of the mission plan previously transferred.

Only one mission plan shall be transferred at a time. The TCS RTP shall not attempt to transfer another mission plan until receipt of a DCM Mission Load

Acknowledge message for the mission plan currently being transferred or the Mission Plan Acknowledge message has not been received after 10 seconds following the transmission of the last message in the mission plan to the DCM.

If the DCM detects any data consistency problems between subsequent AV Waypoint Begin messages in a mission plan, it shall generate a DCM Mission Load Acknowledge message indicating such and shall discard any portion of the mission plan previously transferred.

If the DCM receives a waypoint with too few or too many command messages, it shall generate a DCM Mission Load Acknowledge message indicating such and shall discard any portion of the mission plan previously transferred.

A DCM shall only generate a single DCM Mission Load Acknowledge message for a single Mission\_ID. Once a DCM has generated a DCM Mission Load Acknowledge message reporting an error for a specific Mission\_ID, it shall discard all other waypoints and command messages associated with that Mission\_ID until it receives an AV Waypoint Begin message for that Mission\_ID with the AV\_Waypoint\_Number field set to 1.

### **4.3 Analog Video Interface**

Analog video shall enter TCS in NTSC format on a RS-170 interface.

### **4.4 Digital Video Interface**

Digital video shall be transferred over a high-speed network interface TBD. The protocol is TBD.

## **5. Requirements traceability**

The final IDD will have full requirement traceability. Currently the traceability is TBD.

## **6. Notes**

### **6.1 DTED Support Data**

DTED support data files shall be provided to the DCMs by the TCS Core. These files shall be provided only while the TCS is in the maintenance mode. Files containing DTED data for the areas covering the next mission to be performed shall be transferred by the TCS initiating an FTP connection to the DCM across the same physical network interface used by the command and status messages. Each DCM shall support receipt and storage of a minimum of 200 megabytes of DTED files.

## 6.2 Acronym List

|         |   |
|---------|---|
| ACS     | Aerial Common Sensor  |
| ADOCS   | Automated Deep Operations Coordination System                     |
| ADT     | Air Data Terminal   |
| AFATDS  | Advanced Field Artillery Tactical Data System                     |
| AFMSS   | Air Force Mission Support System                                  |
| AIRTA   | Airborne Reconnaissance Information Technical Architecture        |
| ASAS    | All Source Analysis System  |
| ASD     | Assistant Secretary of Defense                                    |
| ATHS    | Automated Target Hand-off System                                  |
| ATM     | Asynchronous Transfer Mode  |
| ATWCS   | Advanced Tactical Weapons Control Station                         |
| AV      | Air Vehicle   |
| C4I     | Command, Control, Communications, Computers, and Intelligence     |
| CARS    | Contingency Airborne Reconnaissance System                        |
| CCTV    | Closed Circuit Television   |
| CGS     | Common Ground Station   |
| CIGSS   | Common Imagery Ground/Surface System                              |
| COMPASS | Common Operational Modeling, Planning, And Simulation System      |
| COSIP   | Computer Open Systems Implementation Program                      |
| COTS    | Commercial Off The Shelf  |
| DCM     | Datalink Control Module   |
| DII/COE | Defense Information Infrastructure / Common Operating Environment |
| DoD     | Department of Defense   |
| DODI    | Department Of Defense Instruction                                 |
| DTED    | Digital Terrain Elevation Data                                    |
| EO      | Electro-optical   |
| ETRAC   | Enhanced Tactical Radar Correlator                                |
| FD/L    | Fault Detection / Location  |
| FOV     | Field Of View   |
| GDT     | Ground Data Terminal  |
| GFE     | Government Furnished Equipment                                    |
| GMT     | Greenwich Mean Time   |
| GPS     | Global Positioning System   |
| GRCS    | Guardrail Common Sensor   |
| GSM     | Ground Station Module   |
| HAE     | High Altitude and Endurance                                       |
| HCI     | Human-Computer Interface  |
| IAS     | Intelligence Analysis System                                      |
| IDD     | Interface Design Description                                      |

|           |   |
|-----------|---|
| IDT       | Integrated Data Terminal  |
| IFF       | Identify Friend or Foe  |
| IIRS      | Imagery Interpretability Rating Scale                               |
| IMU       | Inertial Measurement Unit   |
| INS       | Inertial Navigation System  |
| I/O       | Input / Output  |
| IP        | Internet Protocol   |
| IPF       | Integrated Processing Facility                                      |
| IR        | Infrared  |
| JDISS     | Joint Deployable Intelligence Support System                        |
| JMCIS     | Joint Maritime Command Information System                           |
| JMF       | Joint Message Format  |
| JPO       | Joint Program Office  |
| JSIPS TEG | Joint Service Imagery Processing System Tactical Exploitation Group |
| JSIPS-N   | Joint Service Imagery Processing System – Navy                      |
| JSTARS    | Joint Standoff Target Attack Radar System                           |
| JTA       | Joint Technical Architecture  |
| LOS       | Line of Sight   |
| LRIP      | Low Rate Initial Production   |
| MAE       | Medium Altitude and Endurance                                       |
| MIES      | Modernized Imagery Exploitation System                              |
| MIL-STD   | Military Standard   |
| MSL       | Mean Sea Level  |
| NITF      | National Imagery Transmission Format                                |
| NDI       | Non-Developmental Item  |
| NTSC      | National Television Standards Committee                             |
| PEO       | Program Executive Office  |
| PVC       | Permanent Virtual Circuits  |
| RTP       | Real Time Processor   |
| SAR       | Synthetic Aperture Radar  |
| SATCOM    | Satellite Communication   |
| SPIRIT    | Special Purpose Integrated Remote Intelligence Terminal             |
| TAMPS     | Tactical Aircraft Mission Planning System                           |
| TBD       | To Be Determined  |
| TBMCS     | Theater Battle Management Core System                               |
| TCP       | Transmission Control Protocol                                       |
| TCS       | Tactical Control System   |
| TUAV      | Tactical Unmanned Aerial Vehicle                                    |
| UAV       | Unmanned Aerial Vehicle   |
| UAVJPO    | Unmanned Aerial Vehicle Joint Project Office                        |
| UTM       | Universal Time Macerator  |
| VCR       | Video Cassette Recorder   |

|        |                              |
|--------|------------------------------|
| VDC    | Volts Direct Current         |
| VMF    | Variable Message Format      |
| WGS 84 | World Geodetic System 84     |
| XDR    | External Data Representation |

## **7. Predator specific appendix**

This section discusses the predator specific implementation of the AV Standard Interface. It includes information on which messages and fields are supported by Predator and any Predator specific range values if applicable.

### **7.1 Predator supported messages**

The following messages and fields are supported by Predator. All fields that are not supported shall be set to zero.

### 7.1.1 PDCM To TCS Messages

#### PDCM to TCS Messages

| Message Name   | Message ID | Supported | Frequency | Length | TCP/IP Overhead | Bandwidth Required |
|--|------------|-----------|-----------|--------|-----------------|--------------------|
| AV Position Status Message                           | 1          | yes       | 10 Hz     | 252    | 40              | 2920               |
| AV INS Status Message                                | 2          | yes       | 10 Hz     | 192    | 40              | 2320               |
| AV GPS Status Message                                | 3          | yes       | 1 Hz      | 264    | 40              | 304                |
| AV EOIR Status Message                               | 4          | yes       | 5 Hz      | 212    | 40              | 1260               |
| AV Line of Sight Ground Data Terminal Status Message | 5          | yes       | 5 Hz      | 200    | 40              | 1200               |
| AV Line of Sight Air Data Terminal Status Message    | 6          | yes       | 5 Hz      | 140    | 40              | 900                |
| AV Piston Engine Status Message                      | 7          | yes       | 5 Hz      | 204    | 40              | 1220               |
| AV Fuel Status Message                               | 8          | yes       | 1 Hz      | 68     | 40              | 108                |
| AV Electrical System Status Message                  | 9          | yes       | 5 Hz      | 112    | 40              | 760                |
| AV Analog Video System Status Message                | 10         | yes       | 1 Hz      | 120    | 40              | 160                |
| AV Lights and Landing Gear Status Message            | 11         | yes       | 1 Hz      | 60     | 40              | 100                |
| AV IFF Status Message                                | 12         | yes       | 1 Hz      | 76     | 40              | 116                |
| AV SAR Status Message                                | 15         | yes       | TBD       | 128    | 40              | TBD                |
| AV Warning Message                                   | 19         | yes       | 1 Hz      | 236    | 40              | 276                |
| DCM Protocol Error Message                           | 37         | yes       | As Needed | 168    | 40              | 208                |
| DCM Mission Load Acknowledge Message                 | 38         | yes       | As Needed | 44     | 40              | 84                 |
| AV Servo Status Message                              | 39         | yes       | 1 Hz      | 352    | 40              | 392                |

Table 7.1.1-1 PDCM to TCS Messages

The total bandwidth required for the messages sent from the Predator DCM to the TCS is 12328 bytes per second or approximately 98.6 kilobits per second.

### 7.1.1.1 AV Position Status Message

| AV Position Status Message Field | Data Element Name                     | Supported | Range Values        | Comments                       |
|----------------------------------|---------------------------------------|-----------|---------------------|--------------------------------|
| 1                                | <b>Message_ID</b>                     | yes       | 1                   | 1 = AV Position Status Message |
| 2                                | <b>Message_Version</b>                | yes       | 2                   |                                |
| 3                                | <b>AV_Type</b>                        | yes       | 1                   |                                |
| 4                                | <b>AV_Tail_Number</b>                 | yes       | standard            |                                |
| 5                                | <b>Mission_ID</b>                     | yes       | standard            |                                |
| 6                                | <b>AV_Current_Nav_Altitude_Source</b> | yes       | standard            |                                |
| 7                                | <b>AV_Altitude</b>                    | yes       | -3000 <= x <= 60000 |                                |
| 8                                | <b>AV_Climb_Rate</b>                  | yes       | standard            |                                |
| 9                                | <b>AV_Current_Nav_Position_Source</b> | yes       | standard            |                                |
| 10                               | <b>AV_Latitude</b>                    | yes       | standard            |                                |
| 11                               | <b>AV_Longitude</b>                   | yes       | standard            |                                |
| 12                               | <b>AV_NAV_Orientation_Source</b>      | yes       | standard            |                                |
| 13                               | <b>AV_Roll</b>                        | yes       | standard            |                                |
| 14                               | <b>AV_Pitch</b>                       | yes       | standard            |                                |
| 15                               | <b>AV_Heading</b>                     | yes       | standard            |                                |
| 16                               | <b>AV_Pitch_Rate</b>                  | yes       | standard            |                                |
| 17                               | <b>AV_Roll_Rate</b>                   | yes       | standard            |                                |
| 18                               | <b>AV_Yaw_Rate</b>                    | yes       | standard            |                                |
| 19                               | <b>AV_Angle_Of_Attack_1</b>           | yes       | -204 <= x <= 204    |                                |
| 20                               | <b>AV_Angle_Of_Attack_2</b>           | yes       | -25.5 <= x <= 25.5  |                                |

| AV Position Status Message Field | Data Element Name         | Supported | Range Values        | Comments  |
|----------------------------------|---------------------------|-----------|---------------------|---|
| 21                               | AV_AOA_Sensor_Active      | yes       | 1 <= x <= 2         | 1 = Angle of Attack Sensor 1. It is a vane on the nose boom.<br>2 = Angle of Attack Sensor 2. It is a pressure based sensor on the port wing. |
| 22                               | AV_GPS_Time_Week          | yes       | standard            |   |
| 23                               | AV_GPS_Time_Second        | yes       | standard            |   |
| 24                               | AV_GPS_Time_Ns            | no        | 0                   |   |
| 25                               | AV_Baro_Altitude          | yes       | -3000 <= x <= 60000 |   |
| 26                               | AV_Radar_Altitude         | no        | 0                   |   |
| 27                               | AV_Magnetometer_Heading   | yes       | standard            |   |
| 28                               | AV_Ground_Track           | yes       | standard            |   |
| 29                               | AV_Ground_Speed           | yes       | standard            |   |
| 30                               | AV_Airspeed_1             | yes       | standard            | This airspeed comes from the starboard wing unheated sensor.  |
| 31                               | AV_Airspeed_2             | yes       | standard            | This airspeed comes form the port wing heated sensor.   |
| 32                               | AV_Airspeed_Sensor_Active | yes       | standard            | 1 = Starboard wing unheated sensor.<br>2 = Port wing heated sensor.   |
| 33                               | AV_Measured_Wind_Heading  | yes       | standard            |   |
| 34                               | AV_Measured_Wind_Speed    | yes       | standard            |   |
| 35                               | AV_Nav_Mode               | yes       | standard            |   |
| 36                               | AV_Next_Waypoint          | yes       | 0 <= x <= 255       | 0 = Not in waypoint control mode.   |
| 37                               | AV_TTG_Next_Waypoint      | yes       | standard            |   |
| 38                               | AV_Air_Temperature        | yes       | standard            |   |

### 7.1.1.2 AV INS Status Message

| AV INS Status Message Field | Data Element Name                   | Supported | Range Values        | Comments |
|-----------------------------|-------------------------------------|-----------|---------------------|----------|
| 1                           | <b>Message_ID</b>                   | yes       | 2                   |          |
| 2                           | <b>Message_Version</b>              | yes       | 2                   |          |
| 3                           | <b>AV_Type</b>                      | yes       | 1                   |          |
| 4                           | <b>AV_Tail_Number</b>               | yes       | standard            |          |
| 5                           | <b>Mission_ID</b>                   | yes       | standard            |          |
| 6                           | <b>AV_INS_Er_NS</b>                 | no        | 0                   |          |
| 7                           | <b>AV_INS_Er_EW</b>                 | no        | 0                   |          |
| 8                           | <b>AV_INS_Er_Alt</b>                | no        | 0                   |          |
| 9                           | <b>AV_INS_Mode</b>                  | yes       | TBD                 |          |
| 10                          | <b>AV_INS_Alt</b>                   | yes       | -3000 <= x <= 60000 |          |
| 11                          | <b>AV_INS_Lat</b>                   | yes       | 0                   |          |
| 12                          | <b>AV_INS_Lon</b>                   | yes       | standard            |          |
| 13                          | <b>AV_INS_East_Velocity</b>         | no        | 0                   |          |
| 14                          | <b>AV_INS_North_Velocity</b>        | no        | 0                   |          |
| 15                          | <b>AV_INS_Altitude_Velocity</b>     | no        | 0                   |          |
| 16                          | <b>AV_INS_East_Acceleration</b>     | no        | 0                   |          |
| 17                          | <b>AV_INS_North_Acceleration</b>    | no        | 0                   |          |
| 18                          | <b>AV_INS_Altitude_Acceleration</b> | no        | 0                   |          |
| 19                          | <b>AV_INS_Pitch</b>                 | yes       | standard            |          |
| 20                          | <b>AV_INS_Roll</b>                  | yes       | standard            |          |
| 21                          | <b>AV_INS_Heading</b>               | yes       | standard            |          |
| 22                          | <b>AV_INS_Pitch_Rate</b>            | no        | 0                   |          |
| 23                          | <b>AV_INS_Roll_Rate</b>             | no        | 0                   |          |
| 24                          | <b>AV_INS_Yaw_Rate</b>              | no        | 0                   |          |
| 25                          | <b>AV_INS_Time_Week</b>             | yes       | standard            |          |
| 26                          | <b>AV_INS_Time_Second</b>           | yes       | standard            |          |
| 27                          | <b>AV_INS_Time_Ns</b>               | no        | 0                   |          |

### 7.1.1.3 AV GPS Status Message

| AV GPS Status Message Field | Data Element Name               | Supported | Range Values        | Comments |
|-----------------------------|---------------------------------|-----------|---------------------|----------|
| 1                           | <b>Message_ID</b>               | yes       | 3                   |          |
| 2                           | <b>Message_Version</b>          | yes       | 2                   |          |
| 3                           | <b>AV_Type</b>                  | yes       | 1                   |          |
| 4                           | <b>AV_Tail_Number</b>           | yes       | standard            |          |
| 5                           | <b>Mission_ID</b>               | yes       | standard            |          |
| 6                           | <b>AV_GPS_Time_Week</b>         | yes       | standard            |          |
| 7                           | <b>AV_GPS_Time_Second</b>       | yes       | standard            |          |
| 8                           | <b>AV_GPS_Time_Ns</b>           | no        | 0                   |          |
| 9                           | <b>AV_GPS_Mode</b>              | yes       | 1,3                 |          |
| 10                          | <b>AV_GPS_Alt</b>               | yes       | -3000 <= x <= 60000 |          |
| 11                          | <b>AV_GPS_Climb_Rate</b>        | yes       | -1536 <= x <= 1536  |          |
| 12                          | <b>AV_GPS_Lat</b>               | yes       | standard            |          |
| 13                          | <b>AV_GPS_Lon</b>               | yes       | standard            |          |
| 14                          | <b>AV_GPS_Roll</b>              | no        | 0                   |          |
| 15                          | <b>AV_GPS_Pitch</b>             | no        | 0                   |          |
| 16                          | <b>AV_GPS_Heading</b>           | no        | 0                   |          |
| 17                          | <b>AV_GPS_Ground_Track</b>      | yes       | standard            |          |
| 18                          | <b>AV_GPS_Ground_Speed</b>      | yes       | 0 <= x <= 800       |          |
| 19                          | <b>AV_GPS_Pitch_Rate</b>        | no        | 0                   |          |
| 20                          | <b>AV_GPS_Roll_Rate</b>         | no        | 0                   |          |
| 21                          | <b>AV_GPS_Yaw_Rate</b>          | no        | 0                   |          |
| 22                          | <b>AV_GPS_CEP</b>               | yes       | standard            |          |
| 23                          | <b>AV_GPS_Alt_Err</b>           | yes       | standard            |          |
| 24                          | <b>AV_GPS_Stat</b>              | yes       | x = 0-4,6           |          |
| 25                          | <b>AV_GPS_Satellites_In_Fix</b> | yes       | 0 <= x <= 4         |          |
| 26                          | <b>AV_GPS_Sat1 SVN ID</b>       | yes       | standard            |          |
| 27                          | <b>AV_GPS_Sat2 SVN ID</b>       | yes       | standard            |          |

| AV GPS Status Message Field | Data Element Name   | Supported | Range Values | Comments |
|-----------------------------|---------------------|-----------|--------------|----------|
| 28                          | AV_GPS_Sat3 SVN_ID  | yes       | standard     |          |
| 29                          | AV_GPS_Sat4 SVN_ID  | yes       | standard     |          |
| 30                          | AV_GPS_Sat5 SVN_ID  | no        | 0            |          |
| 31                          | AV_GPS_Sat6 SVN_ID  | no        | 0            |          |
| 32                          | AV_GPS_Sat7 SVN_ID  | no        | 0            |          |
| 33                          | AV_GPS_Sat8 SVN_ID  | no        | 0            |          |
| 34                          | AV_GPS_Sat9 SVN_ID  | no        | 0            |          |
| 35                          | AV_GPS_Sat10 SVN_ID | no        | 0            |          |
| 36                          | AV_GPS_Sat11 SVN_ID | no        | 0            |          |
| 37                          | AV_GPS_Sat12 SVN_ID | no        | 0            |          |
| 38                          | AV_GPS_Sig_Str_1    | yes       | standard     |          |
| 39                          | AV_GPS_Sig_Str_2    | yes       | standard     |          |
| 40                          | AV_GPS_Sig_Str_3    | yes       | standard     |          |
| 41                          | AV_GPS_Sig_Str_4    | yes       | standard     |          |
| 42                          | AV_GPS_Sig_Str_5    | no        | 0            |          |
| 43                          | AV_GPS_Sig_Str_6    | no        | 0            |          |
| 44                          | AV_GPS_Sig_Str_7    | no        | 0            |          |
| 45                          | AV_GPS_Sig_Str_8    | no        | 0            |          |
| 46                          | AV_GPS_Sig_Str_9    | no        | 0            |          |
| 47                          | AV_GPS_Sig_Str_10   | no        | 0            |          |
| 48                          | AV_GPS_Sig_Str_11   | no        | 0            |          |
| 49                          | AV_GPS_Sig_Str_12   | no        | 0            |          |

#### 7.1.1.4 AV EOIR Status Message

| AV EOIR Status Message Field | Data Element Name                 | Supported | Range Values    | Comments                                  |
|------------------------------|-----------------------------------|-----------|-----------------|---|
| 1                            | <b>Message_ID</b>                 | yes       | 4               |   |
| 2                            | <b>Message_Version</b>            | yes       | 2               |   |
| 3                            | <b>AV_Type</b>                    | yes       | 1               |   |
| 4                            | <b>AV_Tail_Number</b>             | yes       | standard        |   |
| 5                            | <b>Mission_ID</b>                 | yes       | standard        |   |
| 6                            | <b>PL_ID</b>                      | no        | 0               |   |
| 7                            | <b>PL_Active_Sensor</b>           | yes       | standard        |   |
| 8                            | <b>EO_Payload_Camera_Selected</b> | yes       | 0 <= x <= 2     | 0 = None<br>1 = EO wide<br>2 = EO Spotter |
| 9                            | <b>PL_Active_Sensor_Status</b>    | yes       | standard        |   |
| 10                           | <b>PL_Pointing_Mode</b>           | yes       | 0 <= x <= 1,3,4 | 4 = Rate mode                             |
| 11                           | <b>PL_Pointer_Lat</b>             | yes       | standard        |   |
| 12                           | <b>PL_Pointer_Lon</b>             | yes       | standard        |   |
| 13                           | <b>PL_Depression_Angle</b>        | yes       | standard        |   |
| 14                           | <b>PL_Azimuth_Angle</b>           | yes       | standard        |   |
| 15                           | <b>PL_Depression_Rate</b>         | no        | 0               |   |
| 16                           | <b>PL_Azimuth_Rate</b>            | no        | 0               |   |
| 17                           | <b>PL_LOS_Range_to_Target</b>     | yes       | standard        |   |
| 18                           | <b>PL_Ground_Range_to_Target</b>  | yes       | standard        |   |
| 19                           | <b>Focal_Length</b>               | yes       | standard        |   |
| 20                           | <b>FOV_Horizontal</b>             | yes       | standard        |   |
| 21                           | <b>FOV_Vertical</b>               | yes       | standard        |   |
| 22                           | <b>PL_IR_Polarity</b>             | yes       | standard        |   |
| 23                           | <b>PL_IR_Gain</b>                 | yes       | standard        |   |
| 24                           | <b>PL_Image_Ang_to_North</b>      | no        | 0               |   |
| 25                           | <b>PL_Image_Datum</b>             | yes       | standard        |   |
| 26                           | <b>PL_Image_Category</b>          | yes       | standard        |   |
| 27                           | <b>PL_Image_Oblliquity_Angle</b>  | no        | 0               |   |
| 28                           | <b>PL_Center_Point_Accuracy</b>   | no        | 0               |   |

| AV EOIR Status Message Field | Data Element Name          | Supported | Range Values | Comments |
|------------------------------|----------------------------|-----------|--------------|----------|
| 29                           | PL_Center_Point_Lat        | yes       | standard     |          |
| 30                           | PL_Center_Point_Lon        | yes       | standard     |          |
| 31                           | PL_Image_Collection_Week   | yes       | standard     |          |
| 32                           | PL_Image_Collection_Second | yes       | standard     |          |
| 33                           | PL_Image_Collection_Ns     | no        | 0            |          |

#### 7.1.1.5 AV Line of Sight Ground Data Terminal Status Message

| AV Line Of Sight Ground Data Terminal Status Message | Data Element Name         | Supported | Range Values | Comments     |
|--|---------------------------|-----------|--------------|--------------|
| 1  | Message_ID                | yes       | standard     |              |
| 2  | Message_Version           | yes       | 2            |              |
| 3  | AV_Type                   | yes       | 1            | 1 = Predator |
| 4  | AV_Tail_Number            | yes       | standard     |              |
| 5  | Mission_ID                | yes       | standard     |              |
| 6  | LOS_GDT_ID                | yes       | standard     |              |
| 7  | LOS_GDT_Signal_Strength_1 | yes       | standard     |              |
| 8  | LOS_GDT_Signal_Strength_2 | yes       | standard     |              |
| 9  | LOS_GDT_PLL_Status_1      | no        | 0            |              |
| 10   | LOS_GDT_PLL_Status_2      | no        | 0            |              |
| 11   | LOS_GDT_Carrier_Detect_1  | yes       | standard     |              |
| 12   | LOS_GDT_Carrier_Detect_2  | yes       | standard     |              |

| AV Line Of Sight Ground Data Terminal Status Message | Data Element Name                   | Supported | Range Values | Comments |
|--|-------------------------------------|-----------|--------------|----------|
| 13   | <b>LOS_GDT_Range</b>                | no        | 0            |          |
| 14   | <b>LOS_GDT_Uplink_Power_1</b>       | yes       | 0 <= x <= 10 |          |
| 15   | <b>LOS_GDT_Uplink_Power_2</b>       | yes       | 0 <= x <= 10 |          |
| 16   | <b>LOS_GDT_CPU_Temp</b>             | yes       | standard     |          |
| 17   | <b>LOS_GDT_TX1_Temp</b>             | yes       | standard     |          |
| 18   | <b>LOS_GDT_TX2_Temp</b>             | yes       | standard     |          |
| 19   | <b>LOS_GDT_TX1_Power_Temp</b>       | yes       | standard     |          |
| 20   | <b>LOS_GDT_TX2_Power_Temp</b>       | yes       | standard     |          |
| 21   | <b>LOS_GDT_TX1_Uplink_Freq</b>      | yes       | standard     |          |
| 22   | <b>LOS_GDT_TX2_Uplink_Freq</b>      | yes       | standard     |          |
| 23   | <b>LOS_GDT_RX1_Downlink_Freq</b>    | yes       | standard     |          |
| 24   | <b>LOS_GDT_RX2_Downlink_Freq</b>    | yes       | standard     |          |
| 25   | <b>LOS_GDT_Transmitter_Selected</b> | yes       | standard     |          |
| 26   | <b>LOS_GDT_Cooling_Mode</b>         | yes       | standard     |          |
| 27   | <b>LOS_GDT_28V_Power_Level</b>      | yes       | standard     |          |
| 28   | <b>LOS_GDT_Serial_Comm_Errors</b>   | yes       | standard     |          |
| 29   | <b>LOS_GDT_Antenna_Selected</b>     | yes       | standard     |          |
| 30   | <b>LOS_GDT_Pointing_Azimuth</b>     | yes       | standard     |          |
| 31   | <b>LOS_GDT_Pointing_Elevation</b>   | yes       | standard     |          |
| 32   | <b>LOS_GDT_Tracking_Mode</b>        | yes       | standard     |          |

#### 7.1.1.6 AV Line of Sight Air Data Terminal Status Message

| AV Line Of Sight Air Data Terminal Status Message | Data Element Name                    | Supported | Range Values        | Comments     |
|---|--------------------------------------|-----------|---------------------|--------------|
| 1   | <b>Message_ID</b>                    | yes       | 6                   |              |
| 2   | <b>Message_Version</b>               | yes       | 2                   |              |
| 3   | <b>AV_Type</b>                       | yes       | 1                   | 1 = Predator |
| 4   | <b>AV_Tail_Number</b>                | yes       | standard            |              |
| 5   | <b>Mission_ID</b>                    | yes       | standard            |              |
| 6   | <b>AV_LOS_Data_Link_Active</b>       | yes       | standard            |              |
| 7   | <b>AV_LOS_Ch_1_Uplink_Freq</b>       | yes       | standard            |              |
| 8   | <b>AV_LOS_Ch_2_Uplink_Freq</b>       | yes       | standard            |              |
| 9   | <b>AV_LOS_Ch_1_Downlink_Freq</b>     | yes       | standard            |              |
| 10  | <b>AV_LOS_Ch_2_Downlink_Freq</b>     | yes       | standard            |              |
| 11  | <b>AV_LOS_ADT_Antenna_Selected</b>   | yes       | standard            |              |
| 12  | <b>AV_LOS_ADT_Ant_Select_Mode</b>    | yes       | standard            |              |
| 13  | <b>AV_LOS_Pointing_Azimuth</b>       | yes       | standard            |              |
| 14  | <b>AV_LOS_Pointing_Elevation</b>     | yes       | standard            |              |
| 15  | <b>AV_LOS_ADT_Transmitter_1_Stat</b> | yes       | standard            |              |
| 16  | <b>AV_LOS_ADT_Transmitter_2_Stat</b> | yes       | standard            |              |
| 17  | <b>AV_LOS_ADT_Tx_1_Power</b>         | yes       | $0 \leq x \leq 100$ |              |
| 18  | <b>AV_LOS_ADT_Tx_2_Power</b>         | yes       | $0 \leq x \leq 100$ |              |
| 19  | <b>AV_LOS_Receiver_1_Status</b>      | yes       | standard            |              |
| 20  | <b>AV_LOS_Receiver_2_Status</b>      | yes       | standard            |              |
| 21  | <b>AV_LOS_Sgnl_Strngth_1</b>         | yes       | standard            |              |
| 22  | <b>AV_LOS_Sgnl_Strngth_2</b>         | yes       | standard            |              |
| 23  | <b>AV_LOS_Rcvr_1_Cumul_Err</b>       | yes       | standard            |              |
| 24  | <b>AV_LOS_Rcvr_2_Cumul_Err</b>       | yes       | standard            |              |

### 7.1.1.7 AV Piston Engine Status Message

| AV Piston Engine Status Message Field | Data Element Name                        | Supported | Range Values     | Comments   |
|---------------------------------------|--|-----------|------------------|--|
| 1                                     | <b>Message_ID</b>                        | yes       | 7                |  |
| 2                                     | <b>Message_Version</b>                   | yes       | 2                |  |
| 3                                     | <b>AV_Type</b>                           | yes       | 1                |  |
| 4                                     | <b>AV_Tail_Number</b>                    | yes       | standard         |  |
| 5                                     | <b>Mission_ID</b>                        | yes       | standard         |  |
| 6                                     | <b>Engine_ID</b>                         | yes       | 2                |  |
| 7                                     | <b>Engine_Status</b>                     | yes       | 0,2              |  |
| 8                                     | <b>Engine_Speed</b>                      | yes       | 0 <= x <= 65535  |  |
| 9                                     | <b>Engine_Throttle_Actuator_Position</b> | yes       | standard         |  |
| 10                                    | <b>Engine_Oil_Pressure</b>               | yes       | 0 <= x <= 100    |  |
| 11                                    | <b>Engine_Coolant_Pressure</b>           | no        | 0                |  |
| 12                                    | <b>Engine_Manifold_Pressure</b>          | yes       | standard         |  |
| 13                                    | <b>Engine_Fuel_Pressure</b>              | yes       | standard         |  |
| 14                                    | <b>Engine_Oil_Temperature</b>            | yes       | -60 <= x <= 451  |  |
| 15                                    | <b>Engine_Coolant_Temperature</b>        | yes       | -60 <= x <= 451  |  |
| 16                                    | <b>Engine_Exhaust_Temperature_1</b>      | yes       | -55 <= x <= 1600 |  |
| 17                                    | <b>Engine_Exhaust_Temperature_2</b>      | yes       | -55 <= x <= 1600 |  |
| 18                                    | <b>Engine_Exhaust_Temperature_3</b>      | yes       | -55 <= x <= 1600 |  |
| 19                                    | <b>Engine_Exhaust_Temperature_4</b>      | yes       | -55 <= x <= 1600 |  |
| 20                                    | <b>Engine_Cyl_Head_Temperature</b>       | yes       | -60 <= x <= 451  |  |
| 21                                    | <b>Engine_Manifold_Temperature</b>       | no        | 0                |  |
| 22                                    | <b>Engine_Turbo_Oil_Temperature</b>      | yes       | standard         | This field is valid for the Rotax 914 turbocharged engine only. For the Rotax 912 engine this field shall be set to 0. |
| 23                                    | <b>Engine_Oil_Level</b>                  | yes       | standard         |  |

| AV Piston Engine Status Message Field | Data Element Name                     | Supported | Range Values     | Comments |
|---------------------------------------|---------------------------------------|-----------|------------------|----------|
| 24                                    | <b>Engine_Fuel_Tank_Selected</b>      | no        | 0                |          |
| 25                                    | <b>Engine_Alternator_Current</b>      | no        | 0                |          |
| 26                                    | <b>Engine_Alternator_Voltage</b>      | yes       | standard         |          |
| 27                                    | <b>Engine_Alternator_Temperature</b>  | yes       | -55 <= x <= 1600 |          |
| 28                                    | <b>Engine_Cooling_Fan_Status</b>      | yes       | standard         |          |
| 29                                    | <b>Engine_Ignition_Coil_1_Enabled</b> | yes       | standard         |          |
| 30                                    | <b>Engine_Ignition_Coil_2_Enabled</b> | yes       | standard         |          |

#### 7.1.1.8 AV Fuel Status Message

One copy of this message shall be sent from the PDCM for each fuel tank in the AV.

| AV Fuel Status Message Field | Data Element Name              | Supported | Range Values | Comments                         |
|------------------------------|--------------------------------|-----------|--------------|----------------------------------|
| 1                            | <b>Message_ID</b>              | yes       | 8            |                                  |
| 2                            | <b>Message_Version</b>         | yes       | 2            |                                  |
| 3                            | <b>AV_Type</b>                 | yes       | 1            |                                  |
| 4                            | <b>AV_Tail_Number</b>          | yes       | standard     |                                  |
| 5                            | <b>Mission_ID</b>              | yes       | standard     |                                  |
| 6                            | <b>Fuel_Tank_ID</b>            | yes       | 0 <= x <= 1  | 0 = Forward tank<br>1 = Aft tank |
| 7                            | <b>Fuel_Tank_Current_Level</b> | yes       | standard     |                                  |
| 8                            | <b>Fuel_Tank_Flow_Rate_Out</b> | yes       | standard     |                                  |
| 9                            | <b>Fuel_Tank_Flow_Rate_In</b>  | yes       | standard     |                                  |
| 10                           | <b>Fuel_Tank_Pressure</b>      | yes       | standard     |                                  |

### 7.1.1.9 AV Electrical System Status Message

| AV<br>Electrical<br>System<br>Status<br>Message<br>Field | Data Element Name           | Supported | Range Values         | Comments |
|--|-----------------------------|-----------|----------------------|----------|
| 1  | <b>Message_ID</b>           | yes       | 9                    |          |
| 2  | <b>Message_Version</b>      | yes       | 2                    |          |
| 3  | <b>AV_Type</b>              | yes       | 1                    |          |
| 4  | <b>AV_Tail_Number</b>       | yes       | standard             |          |
| 5  | <b>Mission_ID</b>           | yes       | standard             |          |
| 6  | <b>AV_40VDC_Bus_Voltage</b> | yes       | $0 \leq x \leq 51.1$ |          |
| 7  | <b>AV_28VDC_Bus_Voltage</b> | yes       | $0 \leq x \leq 40.5$ |          |
| 8  | <b>AV_Battery_Voltage_1</b> | yes       | $0 \leq x \leq 40.5$ |          |
| 9  | <b>AV_Battery_Current_1</b> | yes       | $-20 \leq x \leq 82$ |          |
| 10   | <b>AV_Battery_Voltage_2</b> | no        | 0                    |          |
| 11   | <b>AV_Battery_Current_2</b> | no        | 0                    |          |
| 12   | <b>AV_Battery_Voltage_3</b> | no        | 0                    |          |
| 13   | <b>AV_Battery_Current_3</b> | no        | 0                    |          |
| 14   | <b>AV_Battery_Voltage_4</b> | no        | 0                    |          |
| 15   | <b>AV_Battery_Current_4</b> | no        | 0                    |          |

### 7.1.1.10 AV Analog Video System Status Message

| <b>AV Analog Video System Status Message Field</b> | <b>Data Element Name</b>             | <b>Supported</b> | <b>Range Values</b> | <b>Comments</b>  |
|--|--------------------------------------|------------------|---------------------|--|
| 1  | <b>Message_ID</b>                    | yes              | 10                  |  |
| 2  | <b>Message_Version</b>               | yes              | 2                   |  |
| 3  | <b>AV_Type</b>                       | yes              | 1                   |  |
| 4  | <b>AV_Tail_Number</b>                | yes              | standard            |  |
| 5  | <b>Mission_ID</b>                    | yes              | standard            |  |
| 6  | <b>AV_Video_Mux_Power</b>            | yes              | standard            |  |
| 7  | <b>AV_Video_Downlink_Ch_1_Source</b> | yes              | 0 <= x <= 10        | 0 = None   |
| 8  | <b>AV_Video_Downlink_Ch_2_Source</b> | yes              | 0 <= x <= 10        | 0 = None   |
| 9  | <b>AV_Video_Downlink_Ch_3_Source</b> | yes              | 0 <= x <= 10        | 0 = None   |
| 10   | <b>AV_Video_Downlink_Ch_4_Source</b> | yes              | 0 <= x <= 10        | 0 = None   |
| 11   | <b>AV_VCR_Power_1</b>                | yes              | standard            |  |
| 12   | <b>AV_VCR_Mode_1</b>                 | yes              | standard            |  |
| 13   | <b>AV_VCR_Counter_1</b>              | yes              | standard            |  |
| 14   | <b>AV_VCR_Record_Source_1</b>        | yes              | 0 <= x <= 4         | 0 = None<br>1 = Spotter<br>2 = Wide angle<br>3 = IR<br>4 = Nose camera |
| 15   | <b>AV_VCR_Power_2</b>                | yes              | standard            |  |
| 16   | <b>AV_VCR_Mode_2</b>                 | yes              | standard            |  |
| 17   | <b>AV_VCR_Counter_2</b>              | yes              | standard            |  |

| <b>AV Analog Video System Status Message Field</b> | <b>Data Element Name</b>          | <b>Supported</b> | <b>Range Values</b> | <b>Comments</b>   |
|--|-----------------------------------|------------------|---------------------|---|
| 18   | <b>AV_VCR_Record_Source_2</b>     | yes              | 0 <= x <= 4         | 0 = None<br>1 = Spotter<br>2 = Wide angle<br>3 = IR<br>4= Nose camera |
| 19   | <b>AV_VCR_Power_3</b>             | yes              | standard            |   |
| 20   | <b>AV_VCR_Mode_3</b>              | yes              | standard            |   |
| 21   | <b>AV_VCR_Counter_3</b>           | yes              | standard            |   |
| 22   | <b>AV_VCR_Record_Source_3</b>     | yes              | 0 <= x <= 4         | 0 = None<br>1 = Spotter<br>2 = Wide angle<br>3 = IR<br>4= Nose camera |
| 23   | <b>AV_VCR_Power_4</b>             | no               | 0                   |   |
| 24   | <b>AV_VCR_Mode_4</b>              | no               | 0                   |   |
| 25   | <b>AV_VCR_Counter_4</b>           | no               | 0                   |   |
| 26   | <b>AV_VCR_Record_Source_4</b>     | no               | 0                   |   |
| 27   | <b>AV_Nose_Camera_Lens_Heater</b> | yes              | standard            |   |

### 7.1.1.11 AV Lights and Landing Gear Status Message

| AV Lights And landing Gear Status Message Field | Data Element Name                | Supported | Range Values    | Comments                     |
|---|----------------------------------|-----------|-----------------|------------------------------|
| 1   | <b>Message_ID</b>                | yes       | 11              |                              |
| 2   | <b>Message_Version</b>           | yes       | 2               |                              |
| 3   | <b>AV_Type</b>                   | yes       | 1               |                              |
| 4   | <b>AV_Tail_Number</b>            | yes       | standard        |                              |
| 5   | <b>Mission_ID</b>                | yes       | 1 <= x <= 65535 |                              |
| 6   | <b>AV_Navigation_Lights</b>      | yes       | standard        |                              |
| 7   | <b>AV_Landing_Lights</b>         | no        | 0               |                              |
| 8   | <b>AV_Strobe_Light</b>           | yes       | standard        |                              |
| 9   | <b>AV_Hazard_Beacon</b>          | yes       | standard        |                              |
| 10  | <b>AV_Nose_Landing_Gear</b>      | yes       | 0 <= x <= 1     | Indicates commanded position |
| 11  | <b>AV_Port_Landing_Gear</b>      | yes       | 0 <= x <= 1     | Indicates commanded position |
| 12  | <b>AV_Starboard_Landing_Gear</b> | yes       | 0 <= x <= 1     | Indicates commanded position |

### 7.1.1.12 AV IFF Status Message

| AV IFF Status Message Field | Data Element Name      | Supported | Range Values | Comments |
|-----------------------------|------------------------|-----------|--------------|----------|
| 1                           | <b>Message_ID</b>      | yes       | standard     |          |
| 2                           | <b>Message_Version</b> | yes       | 2            |          |
| 3                           | <b>AV_Type</b>         | yes       | 1            |          |
| 4                           | <b>AV_Tail_Number</b>  | yes       | standard     |          |

| AV IFF Status Message Field | Data Element Name       | Supported | Range Values | Comments |
|-----------------------------|-------------------------|-----------|--------------|----------|
| 5                           | Mission_ID              | yes       | standard     |          |
| 6                           | AV_IFF_Power            | yes       | standard     |          |
| 7                           | AV_IFF_Identity         | yes       | standard     |          |
| 8                           | AV_IFF_Mode_C           | yes       | standard     |          |
| 9                           | AV_IFF_Mode_1           | yes       | standard     |          |
| 10                          | AV_IFF_Mode_1_Code      | yes       | standard     |          |
| 11                          | AV_IFF_Mode_2           | yes       | standard     |          |
| 12                          | AV_IFF_Mode_3A          | yes       | standard     |          |
| 13                          | AV_IFF_Mode_3A_Code     | yes       | standard     |          |
| 14                          | AV_IFF_Mode_4           | yes       | standard     |          |
| 15                          | AV_IFF_Mode_4_Code      | yes       | standard     |          |
| 16                          | AV_IFF_Mode_4_Hold      | yes       | standard     |          |
| 17                          | AV_IFF_Operational_Mode | yes       | standard     |          |

#### 7.1.1.13 AV SAR Status Message

| AV SAR Status Message Field | Data Element Name | Supported | Range Values | Comments |
|-----------------------------|-------------------|-----------|--------------|----------|
| 1                           | Message_ID        | yes       | standard     |          |
| 2                           | Message_Version   | yes       | 2            |          |
| 3                           | AV_Type           | yes       | 1            |          |
| 4                           | AV_Tail_Number    | yes       | standard     |          |
| 5                           | Mission_ID        | yes       | standard     |          |
| 6                           | SAR_State         | yes       | standard     |          |
| 7                           | SAR_Resolution_X  | yes       | standard     |          |

| AV SAR Status Message Field | Data Element Name      | Supported | Range Values | Comments |
|-----------------------------|------------------------|-----------|--------------|----------|
| 8                           | SAR_Resolution_Y       | yes       | standard     |          |
| 9                           | SAR_Scene_Nbr          | yes       | standard     |          |
| 10                          | SAR_Center_FOV_Lat     | yes       | standard     |          |
| 11                          | SAR_Center_FOV_Lon     | yes       | standard     |          |
| 12                          | SAR_Frame_Corner_1_Lat | yes       | standard     |          |
| 13                          | SAR_Frame_Corner_1_Lon | yes       | standard     |          |
| 14                          | SAR_Frame_Corner_2_Lat | yes       | standard     |          |
| 15                          | SAR_Frame_Corner_2_Lon | yes       | standard     |          |
| 16                          | SAR_Frame_Corner_3_Lat | yes       | standard     |          |
| 17                          | SAR_Frame_Corner_3_Lon | yes       | standard     |          |
| 18                          | SAR_Frame_Corner_4_Lat | yes       | standard     |          |
| 19                          | SAR_Frame_Corner_4_Lon | yes       | standard     |          |

#### 7.1.1.14 AV Warning Message

| AV Warning Message Field | Data Element            | Supported | Range Values             | Comments |
|--------------------------|-------------------------|-----------|--------------------------|----------|
| 1                        | Message_ID              | yes       | 19                       |          |
| 2                        | Message_Version         | yes       | 2                        |          |
| 3                        | AV_Type                 | yes       | 1                        |          |
| 4                        | AV_Tail_Number          | yes       | standard                 |          |
| 5                        | Mission_ID              | yes       | standard                 |          |
| 6                        | AV_Number_Alert_Updates | yes       | standard                 |          |
| 7                        | AV_Alert_1              | yes       | See Predator Alert Table |          |
| 8                        | AV_Alert_Level_1        | yes       | standard                 |          |
| 9                        | AV_Alert_2              | yes       | See Predator Alert Table |          |

| AV Warning Message Field | Data Element      | Supported | Range Values             | Comments |
|--------------------------|-------------------|-----------|--------------------------|----------|
| 10                       | AV_Alert_Level_2  | yes       | standard                 |          |
| 11                       | AV_Alert_3        | yes       | See Predator Alert Table |          |
| 12                       | AV_Alert_Level_3  | yes       | standard                 |          |
| 13                       | AV_Alert_4        | yes       | See Predator Alert Table |          |
| 14                       | AV_Alert_Level_4  | yes       | standard                 |          |
| 15                       | AV_Alert_5        | yes       | See Predator Alert Table |          |
| 16                       | AV_Alert_Level_5  | yes       | standard                 |          |
| 17                       | AV_Alert_6        | yes       | See Predator Alert Table |          |
| 18                       | AV_Alert_Level_6  | yes       | standard                 |          |
| 19                       | AV_Alert_7        | yes       | See Predator Alert Table |          |
| 20                       | AV_Alert_Level_7  | yes       | standard                 |          |
| 21                       | AV_Alert_8        | yes       | See Predator Alert Table |          |
| 22                       | AV_Alert_Level_8  | yes       | standard                 |          |
| 23                       | AV_Alert_9        | yes       | See Predator Alert Table |          |
| 24                       | AV_Alert_Level_9  | yes       | standard                 |          |
| 25                       | AV_Alert_10       | yes       | See Predator Alert Table |          |
| 26                       | AV_Alert_Level_10 | yes       | standard                 |          |
| 27                       | AV_Alert_11       | yes       | See Predator Alert Table |          |
| 28                       | AV_Alert_Level_11 | yes       | standard                 |          |
| 29                       | AV_Alert_12       | yes       | See Predator Alert Table |          |
| 30                       | AV_Alert_Level_12 | yes       | standard                 |          |
| 31                       | AV_Alert_13       | yes       | See Predator Alert Table |          |
| 32                       | AV_Alert_Level_13 | yes       | standard                 |          |
| 33                       | AV_Alert_14       | yes       | See Predator Alert Table |          |
| 34                       | AV_Alert_Level_14 | yes       | standard                 |          |
| 35                       | AV_Alert_15       | yes       | See Predator Alert Table |          |
| 36                       | AV_Alert_Level_15 | yes       | standard                 |          |
| 37                       | AV_Alert_16       | yes       | See Predator Alert Table |          |
| 38                       | AV_Alert_Level_16 | yes       | standard                 |          |

| AV Warning Message Field | Data Element      | Supported | Range Values             | Comments |
|--------------------------|-------------------|-----------|--------------------------|----------|
| 39                       | AV_Alert_17       | yes       | See Predator Alert Table |          |
| 40                       | AV_Alert_Level_17 | yes       | standard                 |          |
| 41                       | AV_Alert_18       | yes       | See Predator Alert Table |          |
| 42                       | AV_Alert_Level_18 | yes       | standard                 |          |
| 43                       | AV_Alert_19       | yes       | See Predator Alert Table |          |
| 44                       | AV_Alert_Level_19 | yes       | standard                 |          |
| 45                       | AV_Alert_20       | yes       | See Predator Alert Table |          |
| 46                       | AV_Alert_Level_20 | yes       | standard                 |          |
| 47                       | AV_Alert_21       | yes       | See Predator Alert Table |          |
| 48                       | AV_Alert_Level_21 | yes       | standard                 |          |
| 49                       | AV_Alert_22       | yes       | See Predator Alert Table |          |
| 50                       | AV_Alert_Level_22 | yes       | standard                 |          |
| 51                       | AV_Alert_23       | yes       | See Predator Alert Table |          |
| 52                       | AV_Alert_Level_23 | yes       | standard                 |          |
| 53                       | AV_Alert_24       | yes       | See Predator Alert Table |          |
| 54                       | AV_Alert_Level_24 | yes       | standard                 |          |
| 55                       | AV_Alert_25       | yes       | See Predator Alert Table |          |
| 56                       | AV_Alert_Level_25 | yes       | standard                 |          |

### Predator Alert Table

| Alert ID | Alert Level Range | Alert Text                               |
|----------|-------------------|--|
| 1001     | 0 <= x <= 2       | 28 volt bus is low.                      |
| 1002     | 0,2               | A/V range is too close for GPS tracking. |
| 1003     | 0,2               | Accelerometer detects high g forces.     |
| 1004     | 0 <= x <= 1       | Air Vehicle configured for RELAY mode.   |
| 1005     | 0 <= x <= 2       | Air Vehicle Datalink board overheating.  |
| 1006     | 0 <= x <= 2       | Air Vehicle Interface board overheating. |
| 1007     | 0 <= x <= 2       | Air Vehicle Servo board overheating.     |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                         |
|-----------------|--------------------------|---|
| 1008            | 0,2                      | Airborne Receiver #1 PLL unlocked.        |
| 1009            | 0,2                      | Airborne Receiver #2 PLL unlocked.        |
| 1010            | 0,2                      | Airborne Transmitter #1 not installed.    |
| 1011            | 0 <= x <= 2              | Airborne Transmitter #1 overheating.      |
| 1012            | 0,2                      | Airborne Transmitter #1 PLL unlocked.     |
| 1013            | 0,2                      | Airborne Transmitter #2 not installed.    |
| 1014            | 0 <= x <= 2              | Airborne Transmitter #2 overheating.      |
| 1015            | 0,2                      | Airborne Transmitter #2 PLL unlocked.     |
| 1016            | 0 <= x <= 1              | Airspeed is low.                          |
| 1017            | 0,2                      | AOA sensor pot failed, stall protect off. |
| 1018            | 0 <= x <= 1              | AV & GDT uplink freq #1 don't match.      |
| 1019            | 0 <= x <= 1              | AV & GDT uplink freq #2 don't match.      |
| 1020            | 0 <= x <= 1              | Automatic receiver select override.       |
| 1021            | 0 <= x <= 1              | AV TX 1 directional antenna in manual.    |
| 1022            | 0 <= x <= 1              | AV TX 3 directional antenna in manual.    |
| 1023            | 0 <= x <= 1              | Battery leaking current.                  |
| 1024            | 0 <= x <= 1              | Battery in line.                          |
| 1025            | 0,2                      | Cowl flap servo pot failure.              |
| 1026            | 0,2                      | Datalink board not installed.             |
| 1027            | 0,2                      | Datalink board not ready.                 |
| 1028            | 0,2                      | DFCS in running in simulation mode.       |
| 1029            | 0 <= x <= 1              | Directly connected.                       |
| 1030            | 0,2                      | DLC board detects flight comp failure.    |
| 1031            | 0,2                      | EEPROM read failed.                       |
| 1032            | 0,2                      | EEPROM write failed.                      |
| 1033            | 0,2                      | Engine computer lost RX.                  |
| 1034            | 0,2                      | Engine computer lost TX.                  |
| 1035            | 0,2                      | Engine computer RAM failure.              |
| 1036            | 0,2                      | Engine computer ROM failure.              |
| 1037            | 0,2                      | Engine RPM is too high – overspeed.       |
| 1038            | 0,2                      | Engine RPM is very low.                   |
| 1039            | 0,2                      | Engine stopped.                           |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                             |
|-----------------|--------------------------|---|
| 1040            | 0 <= x <= 1              | Error in snooping mission command.            |
| 1041            | 0 <= x <= 1              | Flaps are being commanded down at high speed. |
| 1042            | 0,2                      | Flight computer EEPROM error.                 |
| 1043            | 0,2                      | Flight computer EPROM error.                  |
| 1044            | 0 <= x <= 1              | Front bay cooling fans are disabled.          |
| 1045            | 0,2                      | Fuel pressure drop detected.                  |
| 1046            | 0,2                      | Fuel Pump 1 failure detected.                 |
| 1047            | 0,2                      | Fuel tank selection on override.              |
| 1048            | 0 <= x <= 1              | GCS analog output off bus.                    |
| 1049            | 0 <= x <= 1              | GCS Bit-Sync board off bus.                   |
| 1050            | 0 <= x <= 1              | GCS Command Graph off bus.                    |
| 1051            | 0,2                      | GCS commanding forced lost uplink mode.       |
| 1052            | 0 <= x <= 1              | GCS Headsup dgtzr off bus.                    |
| 1053            | 0 <= x <= 1              | GCS Headsup Graph off bus.                    |
| 1054            | 0 <= x <= 1              | GCS is commanding RF to RELAY mode.           |
| 1055            | 0 <= x <= 1              | GCS No tracker graphics board(s) found.       |
| 1056            | 0,2                      | GCS serial processor failure.                 |
| 1057            | 0 <= x <= 1              | GCS Status graph off bus.                     |
| 1058            | 0,2                      | GCS sysvars[] bad order.                      |
| 1059            | 0,2                      | GCS UHF transmitter is overheating.           |
| 1060            | 0,2                      | GCS battery is very low.                      |
| 1061            | 0,2                      | GCS is operating on battery power.            |
| 1062            | 0,2                      | GDT Receiver #1 PLL unlocked.                 |
| 1063            | 0,2                      | GDT Receiver#2 PLL unlocked.                  |
| 1064            | 0,2                      | GDT Receiver has failed.                      |
| 1065            | 0 <= x <= 1              | GDT Receiver is intermittent.                 |
| 1066            | 0,2                      | GDT to GCS serial interface failed.           |
| 1067            | 0,2                      | GDT Transmitter #1 not installed.             |
| 1068            | 0 <= x <= 2              | GDT Transmitter #1 is overheating.            |
| 1069            | 0,2                      | GDT Transmitter #1 PLL unlocked.              |
| 1070            | 0,2                      | GDT Transmitter #1 not installed.             |
| 1071            | 0 <= x <= 2              | GDT Transmitter #1 is overheating.            |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                         |
|-----------------|--------------------------|---|
| 1072            | 0,2                      | GDT Transmitter #1 PLL unlocked.          |
| 1073            | 0 <= x <= 1              | GDT Transmitter is intermittent.          |
| 1074            | 0 <= x <= 1              | GPS receiver #1 is NOT online.            |
| 1075            | 0 <= x <= 1              | GPS receiver #2 is NOT online.            |
| 1076            | 0,2                      | GPS receivers A/V positions don't match.  |
| 1077            | 0 <= x <= 2              | High Air Vehicle 12 v Vicor Temperature.  |
| 1078            | 0 <= x <= 2              | High Air Vehicle 5 v Vicor Temperature.   |
| 1079            | 0 <= x <= 2              | High Air Vehicle Tx #1 Vicor Temperature. |
| 1080            | 0 <= x <= 2              | High Air Vehicle Tx #2 Vicor Temperature. |
| 1081            | 0 <= x <= 2              | High Air Vehicle Tx #3 Vicor Temperature. |
| 1082            | 0 <= x <= 1              | High exhaust gas temp.                    |
| 1083            | 0,2                      | High side switch #1 overheating.          |
| 1084            | 0,2                      | High side switch #2 overheating.          |
| 1085            | 0,2                      | High side switch #3 overheating.          |
| 1086            | 0,2                      | High side switch #4 overheating.          |
| 1087            | 0,2                      | High sideslip condition.                  |
| 1088            | 0,2                      | Icing condition detected.                 |
| 1089            | 0 <= x <= 1              | Illegal inlink packet received.           |
| 1090            | 0,2                      | Incompatible version of DFS software.     |
| 1091            | 0,2                      | Incompatible version of DGCS software.    |
| 1092            | 0,2                      | INF board detects flight comp failure.    |
| 1093            | 0 <= x <= 1              | INS unit has lost GPS satellites.         |
| 1094            | 0 <= x <= 1              | INS unit is initializing.                 |
| 1095            | 0 <= x <= 1              | INS unit is not fully functional.         |
| 1096            | 0 <= x <= 1              | INS unit is NOT on-line.                  |
| 1097            | 0 <= x <= 1              | INS unit is waiting for initialization.   |
| 1098            | 0,2                      | Instructor overriding uplink.             |
| 1099            | 0 <= x <= 1              | Inter-console link packet #01 received.   |
| 1100            | 0,2                      | Inter-console transmit failure.           |
| 1101            | 0,2                      | Interface board not installed.            |
| 1102            | 0,2                      | Interface board not ready to fly.         |
| 1103            | 0,2                      | Ku LMA is offline.                        |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                         |
|-----------------|--------------------------|---|
| 1104            | 0,2                      | Ku SPMA is auto-resetting, standby.       |
| 1105            | 0,2                      | Ku SPMA is offline.                       |
| 1106            | 0 <= x <= 1              | Landing gear down in cruise mode.         |
| 1107            | 0,2                      | Left aileron computer lost Rx.            |
| 1108            | 0,2                      | Left aileron computer lost Tx.            |
| 1109            | 0,2                      | Left aileron RAM failure.                 |
| 1110            | 0,2                      | Left aileron ROM failure.                 |
| 1111            | 0,2                      | Left aileron servo disabled.              |
| 1112            | 0 <= x <= 1              | Left aileron servo overheating.           |
| 1113            | 0,2                      | Left aileron servo pot failure.           |
| 1114            | 0,2                      | Left brake servo disabled.                |
| 1115            | 0,2                      | Left brake servo overheating.             |
| 1116            | 0,2                      | Left brake servo pot failure.             |
| 1117            | 0,2                      | Left flap servo pot failure.              |
| 1118            | 0,2                      | Left main gear retract malfunction.       |
| 1119            | 0,2                      | Left main gear retract overheating.       |
| 1120            | 0,2                      | Left main retract servo disabled.         |
| 1121            | 0,2                      | Left tail computer lost RX.               |
| 1122            | 0,2                      | Left tail computer lost TX.               |
| 1123            | 0,2                      | Left tail RAM failure.                    |
| 1124            | 0,2                      | Left tail ROM failure.                    |
| 1125            | 0,2                      | Left tail servo disabled.                 |
| 1126            | 0,2                      | Left tail servo overheating.              |
| 1127            | 0,2                      | Left tail servo pot failure.              |
| 1128            | 0,2                      | Lost Ku command link.                     |
| 1129            | 0,2                      | Lost Ku return link.                      |
| 1130            | 0,2                      | Lost LOS downlink.                        |
| 1131            | 0,2                      | Lost LOS uplink.                          |
| 1132            | 0,2                      | Lost UHF downlink.                        |
| 1133            | 0,2                      | Lost UHF uplink.                          |
| 1134            | 0,2                      | Lost uplink disabled in this mission leg. |
| 1135            | 0 <= x <= 1              | Low downlink signal on GDT receiver #1.   |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                              |
|-----------------|--------------------------|--|
| 1136            | 0 <= x <= 1              | Low downlink signal on GDT receiver #2.        |
| 1137            | 0 <= x <= 1              | Low fuel condition.                            |
| 1138            | 0 <= x <= 1              | Low oil condition.                             |
| 1139            | 0 <= x <= 1              | Low uplink signal on AV receiver #1.           |
| 1140            | 0 <= x <= 1              | Low uplink signal on AV receiver #2.           |
| 1141            | 0,2                      | MAP sensor failure detected; using backup.     |
| 1142            | 0 <= x <= 2              | MCT is high.                                   |
| 1143            | 0,2                      | MCT sensor failure detected; using backup.     |
| 1144            | 0,2                      | Miss-Match in TX #1 Omni/Direc. Selection.     |
| 1145            | 0,2                      | Miss-Match in TX #3 Omni/Direc. Selection.     |
| 1146            | 0 <= x <= 1              | Mission is too small. Aborted.                 |
| 1147            | 0 <= x <= 1              | Mission upload has failed; RESEND.             |
| 1148            | 0,2                      | Navigation sensor failure using backup sensor. |
| 1149            | 0,2                      | Need to enter ADR latitude.                    |
| 1150            | 0,2                      | Need to enter ADR longitude.                   |
| 1151            | 0,2                      | Need to enter air vehicle weight.              |
| 1152            | 0,2                      | Need to enter fuel at start of flight.         |
| 1153            | 0,2                      | Need to enter GCS altitude.                    |
| 1154            | 0,2                      | Need to enter GCS latitude.                    |
| 1155            | 0,2                      | Need to enter ground baro.                     |
| 1156            | 0,2                      | Need to enter lost link initial altitude.      |
| 1157            | 0,2                      | Need to enter lost link initial heading.       |
| 1158            | 0,2                      | Need to enter magnetic variation.              |
| 1159            | 0,2                      | Need to enter minimum altitude MSL.            |
| 1160            | 0,2                      | Need to select AV Tail #.                      |
| 1161            | 0 <= x <= 1              | No emergency mission program loaded.           |
| 1162            | 0 <= x <= 1              | No operational mission program loaded.         |
| 1163            | 0,2                      | Nose gear retract malfunction.                 |
| 1164            | 0,2                      | Nose gear retract overheating.                 |
| 1165            | 0,2                      | Nose steering servo pot failure.               |
| 1166            | 0,2                      | Oil pressure is very low.                      |
| 1167            | 0 <= x <= 1              | OP Mission has Lost Link OK in every leg.      |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                       |
|-----------------|--------------------------|---|
| 1168            | 0,2                      | Payload CCSM Bad Address Byte Received. |
| 1169            | 0,2                      | Payload CCSM Bad Sync Byte Received.    |
| 1170            | 0,2                      | Payload CCSM EPROM Error Detected.      |
| 1171            | 0,2                      | Payload CCSM Lost Communication.        |
| 1172            | 0,2                      | Payload CCSM Lost Rx.                   |
| 1173            | 0,2                      | Payload CCSM Lost Tx.                   |
| 1174            | 0,2                      | Payload CCSM RAM Error Detected.        |
| 1175            | 0,2                      | Payload Power Board lost RX.            |
| 1176            | 0,2                      | Payload Power Board lost TX.            |
| 1177            | 0,2                      | Payload Power Board RAM failure.        |
| 1178            | 0,2                      | Payload Power Board ROM failure.        |
| 1179            | 0,2                      | Payload Power Board switch #1 fault.    |
| 1180            | 0,2                      | Payload Power Board switch #2 fault.    |
| 1181            | 0,2                      | Payload Power Board switch #3 fault.    |
| 1182            | 0,2                      | Payload Power Board switch #4 fault.    |
| 1183            | 0,2                      | Payload Power Board switch #5 fault.    |
| 1184            | 0,2                      | Payload Power Board switch #6 fault.    |
| 1185            | 0,2                      | Payload Power Board switch #7 fault.    |
| 1186            | 0,2                      | Payload Power Board switch #8 fault.    |
| 1187            | 0,2                      | Pilot CCSM Bad Address Byte Received.   |
| 1188            | 0,2                      | Pilot CCSM Bad Sync Byte Received.      |
| 1189            | 0,2                      | Pilot CCSM EPROM Error Detected.        |
| 1190            | 0,2                      | Pilot CCSM Lost Communication.          |
| 1191            | 0,2                      | Pilot CCSM Lost Rx.                     |
| 1192            | 0,2                      | Pilot CCSM Lost Tx.                     |
| 1193            | 0,2                      | Pilot CCSM RAM Error Detected.          |
| 1194            | 0,2                      | PPO 1 is offline.                       |
| 1195            | 0,2                      | PPO 2 is offline.                       |
| 1196            | 0,2                      | Prim/secon airspeeds differ (>5 kn.).   |
| 1197            | 0,2                      | Prop pitch servo pot failure.           |
| 1198            | 0,2                      | Radar processor is offline.             |
| 1199            | 0,2                      | Receiver Overrun on FARM Port A.        |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                       |
|-----------------|--------------------------|---|
| 1200            | 0,2                      | Receiver Overrun on FARM Port B.        |
| 1201            | 0 <= x <= 1              | Receiving Ku broadcast uplink.          |
| 1202            | 0 <= x <= 1              | Remote downlink connection.             |
| 1203            | 0,2                      | Right aileron computer lost RX.         |
| 1204            | 0,2                      | Right aileron computer lost TX.         |
| 1205            | 0,2                      | Right aileron RAM failure.              |
| 1206            | 0,2                      | Right aileron ROM failure.              |
| 1207            | 0,2                      | Right aileron servo disabled.           |
| 1208            | 0 <= x <= 1              | Right aileron servo overheating.        |
| 1209            | 0,2                      | Right aileron servo pot failure.        |
| 1210            | 0,2                      | Right brake servo disabled.             |
| 1211            | 0,2                      | Right brake servo overheating.          |
| 1212            | 0,2                      | Right brake servo failure.              |
| 1213            | 0,2                      | Right flap servo pot failure.           |
| 1214            | 0,2                      | Right main gear retract malfunction.    |
| 1215            | 0,2                      | Right main gear retract overheating.    |
| 1216            | 0,2                      | Right main retract servo disabled.      |
| 1217            | 0,2                      | Right tail computer lost RX.            |
| 1218            | 0,2                      | Right tail computer lost TX.            |
| 1219            | 0,2                      | Right tail RAM failure.                 |
| 1220            | 0,2                      | Right tail ROM failure.                 |
| 1221            | 0,2                      | Right tail servo disabled.              |
| 1222            | 0,2                      | Right tail servo overheating.           |
| 1223            | 0,2                      | Right tail servo pot failure.           |
| 1224            | 0,2                      | S-Band Tx #3 battery override imminent. |
| 1225            | 0 <= x <= 1              | SAR antenna status flag set.            |
| 1226            | 0 <= x <= 1              | SAR processor status flag set.          |
| 1227            | 0 <= x <= 1              | SAR Tx/Rx status flag set.              |
| 1228            | 0,2                      | SCM Payload Power Board lost Rx.        |
| 1229            | 0,2                      | SCM Payload Power Board lost Tx.        |
| 1230            | 0,2                      | SCM Payload Power Board RAM failure.    |
| 1231            | 0,2                      | SCM Payload Power Board ROM failure.    |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                              |
|-----------------|--------------------------|--|
| 1232            | 0 <= x <= 1              | Send Ku RF command.                            |
| 1233            | 0 <= x <= 1              | Send Ku satellite command.                     |
| 1234            | 0,2                      | Servo board not installed.                     |
| 1235            | 0,2                      | Servo board not ready.                         |
| 1236            | 0,2                      | Severe stall conditions.                       |
| 1237            | 0,2                      | Stall alpha.                                   |
| 1238            | 0,2                      | Stall conditions.                              |
| 1239            | 0,2                      | Steering servo/pot failed/overheating.         |
| 1240            | 0 <= x <= 1              | SV_SPLIT case un-supported in datalink.c       |
| 1241            | 0 <= x <= 1              | SVB board detects flight comp failure.         |
| 1242            | 0,2                      | Throttle servo pot failure.                    |
| 1243            | 0,2                      | Transmitter in direct connect mode.            |
| 1244            | 0,2                      | Transmitter Underrun on FARM Port B.           |
| 1245            | 0 <= x <= 1              | Transmitting operational mission.              |
| 1246            | 0 <= x <= 1              | Transmitting SAR collection plan.              |
| 1247            | 0,2                      | UAV UHF transmitter is overheating.            |
| 1248            | 0,2                      | UHF GCS in Built-In-Test mode.                 |
| 1249            | 0,2                      | UHF GCS in master order wire acquisition mode. |
| 1250            | 0,2                      | UHF GCS in ranging acquisition mode.           |
| 1251            | 0,2                      | UHF GCS master order wire is bad.              |
| 1252            | 0,2                      | UHF GCS order wire is bad.                     |
| 1253            | 0,2                      | UHF GCS radio is off-line.                     |
| 1254            | 0,2                      | UHF link without Emer/Oper missions.           |
| 1255            | 0,2                      | UHF UAV in Built-In-Test mode.                 |
| 1256            | 0,2                      | UHF UAV in master order acquisition mode.      |
| 1257            | 0,2                      | UHF UAV in order wire acquisition mode.        |
| 1258            | 0,2                      | UHF UAV in ranging acquisition mode.           |
| 1259            | 0,2                      | UHF UAV master order wire bad.                 |
| 1260            | 0,2                      | UHF UAV order wire bad.                        |
| 1270            | 0,2                      | UHF UAV radio is off-line.                     |
| 1271            | 0,2                      | Uplink transmit failure.                       |
| 1272            | 0,2                      | Variable pitch prop servo overheating.         |

| <b>Alert ID</b> | <b>Alert Level Range</b> | <b>Alert Text</b>                       |
|-----------------|--------------------------|---|
| 1273            | 0 <= x <= 1              | VCR Command Error Detected.             |
| 1274            | 0,2                      | Vertical gyro power failure.            |
| 1275            | 0,2                      | Very high exhaust gas temp.             |
| 1276            | 0,2                      | Very high water temperature.            |
| 1277            | 0,2                      | Very low water temperature.             |
| 1278            | 0,2                      | Warning: No left aileron board airdata. |
| 1279            | 0,2                      | Outside of DTED Coverage                |
| 1280            | 0,2                      | Fuel Pump 2 failure detected            |

#### 7.1.1.15 DCM Protocol Error Message

| <b>DCM Protocol Error Message Field</b> | <b>Data Element Name</b>    | <b>Supported</b> | <b>Range Values</b> | <b>Comments</b> |
|---|-----------------------------|------------------|---------------------|-----------------|
| 1                                       | <b>Message_ID</b>           | yes              | standard            |                 |
| 2                                       | <b>Message_Version</b>      | yes              | 2                   |                 |
| 3                                       | <b>AV_Type</b>              | yes              | 1                   |                 |
| 4                                       | <b>AV_Tail_Number</b>       | yes              | standard            |                 |
| 5                                       | <b>Mission_ID</b>           | yes              | standard            |                 |
| 6                                       | <b>Message_ID</b>           | yes              | standard            |                 |
| 7                                       | <b>Offending_Message_ID</b> | yes              | standard            |                 |
| 8                                       | <b>Error_Message</b>        | yes              | standard            |                 |

### 7.1.1.16 DCM Mission Load Acknowledge Message

| DCM<br>Mission<br>Load<br>Acknowledge<br>Message<br>Field | Data Element Name             | Supported | Range Values | Comments |
|---|-------------------------------|-----------|--------------|----------|
| 1   | <b>Message_ID</b>             | yes       | standard     |          |
| 2   | <b>Message_Version</b>        | yes       | 2            |          |
| 3   | <b>AV_Type</b>                | yes       | 1            |          |
| 4   | <b>AV_Tail_Number</b>         | yes       | standard     |          |
| 5   | <b>Mission_ID</b>             | yes       | standard     |          |
| 6   | <b>New_Mission_Plan_ID</b>    | yes       | standard     |          |
| 7   | <b>Mission_Plan_Load_Ack</b>  | yes       | standard     |          |
| 8   | <b>Last_Waypoint_Received</b> | yes       | standard     |          |

### 7.1.1.17 AV Servo Status Message

| DCM<br>Mission<br>Load<br>Acknowledge<br>Message<br>Field | Data Element Name             | Supported | Range Values         | Comments           |
|---|-------------------------------|-----------|----------------------|--------------------|
| 1   | <b>Message_ID</b>             | yes       | standard             |                    |
| 2   | <b>Message_Version</b>        | yes       | 2                    |                    |
| 3   | <b>AV_Type</b>                | yes       | 1                    |                    |
| 4   | <b>AV_Tail_Number</b>         | yes       | standard             |                    |
| 5   | <b>Mission_ID</b>             | yes       | standard             |                    |
| 6   | <b>AV_Servo_1_Current</b>     | yes       | $0 \leq x \leq 25.5$ | Port Aileron Servo |
| 7   | <b>AV_Servo_1_Temperature</b> | yes       | $0 \leq x \leq 255$  | Port Aileron Servo |

| DCM Mission Load Acknowledge Message Field | Data Element Name       | Supported | Range Values   | Comments                             |
|--|-------------------------|-----------|----------------|--------------------------------------|
| 8  | AV_Servo_2_Current      | yes       | 0 <= x <= 25.5 | Starboard Aileron Servo              |
| 9  | AV_Servo_2_Temperature  | yes       | 0 <= x <= 255  | Starboard Aileron Servo              |
| 10   | AV_Servo_3_Current      | yes       | 0 <= x <= 25.5 | Port Flap Servo                      |
| 11   | AV_Servo_3_Temperature  | yes       | 0 <= x <= 255  | Port Flap Servo                      |
| 12   | AV_Servo_4_Current      | yes       | 0 <= x <= 25.5 | Starboard Flap Servo                 |
| 13   | AV_Servo_4_Temperature  | yes       | 0 <= x <= 255  | Starboard Flap Servo                 |
| 14   | AV_Servo_5_Current      | yes       | 0 <= x <= 25.5 | Port Tail Control Surface Servo      |
| 15   | AV_Servo_5_Temperature  | yes       | 0 <= x <= 255  | Port Tail Control Surface Servo      |
| 16   | AV_Servo_6_Current      | yes       | 0 <= x <= 25.5 | Starboard Tail Control Surface Servo |
| 17   | AV_Servo_6_Temperature  | yes       | 0 <= x <= 255  | Starboard Tail Control Surface Servo |
| 18   | AV_Servo_7_Current      | yes       | 0 <= x <= 25.5 | Propeller Pitch Servo                |
| 19   | AV_Servo_7_Temperature  | yes       | 0 <= x <= 255  | Propeller Pitch Servo                |
| 20   | AV_Servo_8_Current      | yes       | 0 <= x <= 25.5 | Port Brake Actuator Servo            |
| 21   | AV_Servo_8_Temperature  | yes       | 0 <= x <= 255  | Port Brake Actuator Servo            |
| 22   | AV_Servo_9_Current      | yes       | 0 <= x <= 25.5 | Starboard Brake Actuator Servo       |
| 23   | AV_Servo_9_Temperature  | yes       | 0 <= x <= 255  | Starboard Brake Actuator Servo       |
| 24   | AV_Servo_10_Current     | yes       | 0 <= x <= 25.5 | Port Landing Gear Retract Servo      |
| 25   | AV_Servo_10_Temperature | yes       | 0 <= x <= 255  | Port Landing Gear Retract Servo      |
| 26   | AV_Servo_11_Current     | yes       | 0 <= x <= 25.5 | Starboard Landing Gear Retract Servo |
| 27   | AV_Servo_11_Temperature | yes       | 0 <= x <= 255  | Starboard Landing Gear Retract Servo |
| 28   | AV_Servo_12_Current.    | yes       | 0 <= x <= 25.5 | Nose Gear Steering Servo             |
| 29   | AV_Servo_12_Temperature | yes       | 0 <= x <= 255  | Nose Gear Steering Servo             |
| 30   | AV_Servo_13_Current     | yes       | 0 <= x <= 25.5 | Nose Gear Retract Servo              |
| 31   | AV_Servo_13_Temperature | yes       | 0 <= x <= 255  | Nose Gear Retract Servo              |
| 32   | AV_Servo_14_Current     | yes       | 0 <= x <= 25.5 | Throttle Servo                       |
| 33   | AV_Servo_14_Temperature | yes       | 0 <= x <= 255  | Throttle Servo                       |
| 34   | AV_Servo_15_Current     | no        | 0              |                                      |
| 35   | AV_Servo_15_Temperature | no        | 0              |                                      |

| DCM Mission Load Acknowledge Message Field | Data Element Name       | Supported | Range Values | Comments |
|--|-------------------------|-----------|--------------|----------|
| 36   | AV_Servo_16_Current     | no        | 0            |          |
| 37   | AV_Servo_16_Temperature | no        | 0            |          |
| 38   | AV_Servo_17_Current     | no        | 0            |          |
| 39   | AV_Servo_17_Temperature | no        | 0            |          |
| 40   | AV_Servo_18_Current     | no        | 0            |          |
| 41   | AV_Servo_18_Temperature | no        | 0            |          |
| 42   | AV_Servo_19_Current     | no        | 0            |          |
| 43   | AV_Servo_19_Temperature | no        | 0            |          |
| 44   | AV_Servo_20_Current     | no        | 0            |          |
| 45   | AV_Servo_20_Temperature | no        | 0            |          |

### 7.1.2 TCS to Predator DCM Messages

#### TCS to PDCM Messages

| Message Name                          | Message ID | Supported | Frequency              |
|---------------------------------------|------------|-----------|------------------------|
| AV Flight Mode Command Message        | 13         | yes       | On TCS operator action |
| AV Flight Envelope Command Message    | 14         | no        |                        |
| AV Lights Command Message             | 24         | yes       | On TCS operator action |
| TCS Position Uplink Message           | 35         | yes       | 1 Hz                   |
| TCS Environmental Data Uplink Message | 27         | yes       | On TCS operator action |

|   |    |     |   |
|---|----|-----|---|
| EOIR Command Message                            | 28 | yes | Manual Control 10Hz, otherwise on TCS operator action |
| AV Analog Video Command Message                 | 22 | yes | On TCS operator action                                |
| AV Waypoint Begin Message                       | 33 | yes | 5 Hz during flight route plan transfer only           |
| AV Piston Engine Command Message                | 25 | yes | On TCS operator action                                |
| AV IFF Command Message                          | 26 | yes | On TCS operator action                                |
| AV Fuel System Command Message                  | 23 | yes | On TCS operator action                                |
| Ground Line of Sight Datalink Command Message   | 29 | yes | On TCS operator action                                |
| Airborne Line of Sight Datalink Command Message | 30 | yes | On TCS operator action                                |
| Airborne SATCOM Datalink Command Message        | 31 | yes | On TCS operator action                                |

**Table 7.1.2-1 TCS to PDCM Messages**

### 7.1.2.1 AV Flight Mode Command Message

| AV Flight Mode Command Message Field | Data Element Name      | Supported | Range Values | Comments |
|--------------------------------------|------------------------|-----------|--------------|----------|
| 1                                    | <b>Message_ID</b>      | yes       | 13           |          |
| 2                                    | <b>Message_Version</b> | yes       | 2            |          |
| 3                                    | <b>AV_Type</b>         | yes       | 1            |          |

| AV Flight Mode Command Message Field | Data Element Name        | Supported | Range Values         | Comments   |
|--------------------------------------|--------------------------|-----------|----------------------|--|
| 4                                    | AV_Tail_Number           | yes       | standard             |  |
| 5                                    | Mission_ID               | yes       | standard             |  |
| 6                                    | Mission_Command          | yes       | standard             |  |
| 7                                    | AV_Flight_mode           | yes       | standard             |  |
| 8                                    | AV_Activate_New_Mission  | yes       | standard             |  |
| 9                                    | AV_New_Mission_ID        | yes       | 0 <= x <= 255        |  |
| 10                                   | AV_Set_Altitude          | yes       | standard             |  |
| 11                                   | AV_New_Altitude          | yes       | -3000 <= x <= 128070 |  |
| 12                                   | AV_Set_Climb_Rate        | no        | 0                    |  |
| 13                                   | AV_New_Climb_Rate        | no        | 0                    |  |
| 14                                   | AV_Set_Airspeed          | yes       | standard             |  |
| 15                                   | AV_New_Airspeed          | yes       | 50 <= x <= 120       |  |
| 16                                   | AV_New_Airspeed_Sensor   | yes       | 0 <= x <= 2          | 0 = Use current active sensor.<br>1 = Use starboard wing sensor.<br>2 = Use port wing sensor.          |
| 17                                   | AV_New_AOA_Sensor_Active | yes       | 0 <= x <= 2          | 0 = Use current active sensor.<br>1 = Use nose boom vane sensor.<br>2 = Use port wing pressure sensor. |
| 18                                   | AV_Set_Heading           | yes       | standard             |  |
| 19                                   | AV_New_Heading           | yes       | standard             |  |
| 20                                   | AV_Fly_To_Latitude       | yes       | standard             |  |
| 21                                   | AV_Fly_To_Longitude      | yes       | standard             |  |
| 22                                   | AV_Fly_To_Altitude       | yes       | standard             |  |
| 23                                   | AV_Arrival_Time_Weeks    | yes       | standard             |  |
| 24                                   | AV_Arrival_Time_Second   | yes       | standard             |  |
| 25                                   | AV_Loiter_Latitude       | yes       | standard             |  |
| 26                                   | AV_Loiter_Longitude      | yes       | standard             |  |
| 27                                   | AV_Loiter_Altitude       | yes       | standard             |  |
| 28                                   | AV_Loiter_Pattern        | yes       | standard             |  |

| AV Flight Mode Command Message Field | Data Element Name       | Supported | Range Values | Comments |
|--------------------------------------|-------------------------|-----------|--------------|----------|
| 29                                   | AV_Loiter_Length        | yes       | standard     |          |
| 30                                   | AV_Loiter_Width         | yes       | standard     |          |
| 31                                   | AV_Loiter_Orientation   | yes       | standard     |          |
| 32                                   | AV_Loiter_Time          | yes       | standard     |          |
| 33                                   | AV_Loiter_Loops         | no        | 0            |          |
| 34                                   | AV_Loiter_Time_Or_Loops | no        | 0            |          |
| 35                                   | AV_Set_Next_Waypoint    | no        | 0            |          |
| 36                                   | AV_New_Next_Waypoint    | no        | 0            |          |

### 7.1.2.2 AV Flight Envelope Command Message

Predator does not currently support this message.

### 7.1.2.3 AV Lights Command Message

| AV Lights Control Message Field | Data Element Name | Supported | Range Values | Comments |
|---------------------------------|-------------------|-----------|--------------|----------|
| 1                               | Message_ID        | yes       | 24           |          |
| 2                               | Message_Version   | yes       | 2            |          |
| 3                               | AV_Type           | yes       | 1            |          |
| 4                               | AV_Tail_Number    | yes       | standard     |          |
| 5                               | Mission_ID        | yes       | standard     |          |

| AV Lights Control Message Field | Data Element Name                 | Supported | Range Values          | Comments   |
|---------------------------------|-----------------------------------|-----------|-----------------------|--|
| 6                               | <b>Mission_Command.</b>           | yes       | standard              |  |
| 7                               | <b>AV_Nav_Lights</b>              | yes       | standard              |  |
| 8                               | <b>AV_Strobe_Lights</b>           | yes       | standard              |  |
| 9                               | <b>AV_Landing_Lights</b>          | no        | 0                     |  |
| 10                              | <b>AV_Rad_Haz_Strobe</b>          | no        | 0                     | There is no override for the radiation hazard strobe. It is only disabled by the lights out range. |
| 11                              | <b>AV_Lights_Out_Range</b>        | yes       | $0 \leq x \leq 127.5$ |  |
| 12                              | <b>AV_Lights_Out_Range_Enable</b> | yes       | standard              |  |

#### 7.1.2.4 TCS Position Uplink Message

| TCS Position Uplink Message Field | Data Element Name             | Supported | Range Values | Comments |
|-----------------------------------|-------------------------------|-----------|--------------|----------|
| 1                                 | <b>Message_ID</b>             | yes       | standard     |          |
| 2                                 | <b>Message_Version</b>        | yes       | 2            |          |
| 3                                 | <b>AV_Type</b>                | yes       | 1            |          |
| 4                                 | <b>AV_Tail_Number</b>         | yes       | standard     |          |
| 5                                 | <b>Mission_ID</b>             | yes       | standard     |          |
| 6                                 | <b>Mission_Command.</b>       | yes       | standard     |          |
| 7                                 | <b>TCS_Latitude</b>           | yes       | standard     |          |
| 8                                 | <b>TCS_Longitude</b>          | yes       | standard     |          |
| 9                                 | <b>TCS_Altitude</b>           | yes       | standard     |          |
|                                   | <b>TCS_Magnetic_Variation</b> | yes       | standard     |          |

### 7.1.2.5 TCS Environmental Data Uplink Message

| TCS Environmental Data Uplink Message Field | Data Element Name                   | Supported | Range Values | Comments |
|---|-------------------------------------|-----------|--------------|----------|
| 1   | <b>Message_ID</b>                   | yes       | 27           |          |
| 2   | <b>Message_Version</b>              | yes       | 2            |          |
| 3   | <b>AV_Type</b>                      | yes       | 1            |          |
| 4   | <b>AV_Tail_Number</b>               | yes       | standard     |          |
| 5   | <b>Mission_ID</b>                   | yes       | standard     |          |
| 6   | <b>Mission_Command.</b>             | yes       | standard     |          |
| 7   | <b>TCS_Barometric</b>               | yes       | standard     |          |
| 8   | <b>TCS_Air_Temperature</b>          | no        | 0            |          |
| 9   | <b>TCS_Wind_Speed_Surface</b>       | no        | 0            |          |
| 10  | <b>TCS_Wind_Direction_Surface</b>   | no        | 0            |          |
| 11  | <b>Fcst_Wind_Speed_3000_Ft</b>      | no        | 0            |          |
| 12  | <b>Fcst_Wind_Direction_3000_Ft</b>  | no        | 0            |          |
| 13  | <b>Fcst_Wind_Speed_6000_Ft</b>      | no        | 0            |          |
| 14  | <b>Fcst_Wind_Direction_6000_Ft</b>  | no        | 0            |          |
| 15  | <b>Fcst_Air_Temp_6000_Ft</b>        | no        | 0            |          |
| 16  | <b>Fcst_Wind_Speed_9000_Ft</b>      | no        | 0            |          |
| 17  | <b>Fcst_Wind_Direction_9000_Ft</b>  | no        | 0            |          |
| 18  | <b>Fcst_Air_Temp_9000_Ft</b>        | no        | 0            |          |
| 19  | <b>Fcst_Wind_Speed_12000_Ft</b>     | no        | 0            |          |
| 20  | <b>Fcst_Wind_Direction_12000_Ft</b> | no        | 0            |          |
| 21  | <b>Fcst_Air_Temp_12000_Ft</b>       | no        | 0            |          |
| 22  | <b>Fcst_Wind_Speed_18000_Ft</b>     | no        | 0            |          |
| 23  | <b>Fcst_Wind_Direction_18000_Ft</b> | no        | 0            |          |
| 24  | <b>Fcst_Air_Temp_18000_Ft</b>       | no        | 0            |          |
| 25  | <b>Fcst_Wind_Speed_24000_Ft</b>     | no        | 0            |          |

| TCS Environmental Data Uplink Message Field | Data Element Name            | Supported | Range Values | Comments |
|---|------------------------------|-----------|--------------|----------|
| 26  | Fcst_Wind_Direction_24000_Ft | no        | 0            |          |
| 27  | Fest_Air_Temp_24000_Ft       | no        | 0            |          |
| 28  | Fcst_Wind_Speed_30000_Ft     | no        | 0            |          |
| 29  | Fest_Wind_Direction_30000_Ft | no        | 0            |          |
| 30  | Fest_Air_Temp_30000_Ft       | no        | 0            |          |
| 31  | Fcst_Wind_Speed_34000_Ft     | no        | 0            |          |
| 32  | Fest_Wind_Direction_34000_Ft | no        | 0            |          |
| 33  | Fest_Air_Temp_34000_Ft       | no        | 0            |          |
| 34  | Fest_Wind_Speed_39000_Ft     | no        | 0            |          |
| 35  | Fest_Wind_Direction_39000_Ft | no        | 0            |          |
| 36  | Fest_Air_Temp_39000_Ft       | no        | 0            |          |

#### 7.1.2.6 AV EOIR Command Message

| AV EOIR Command Message Field | Data Element Name | Supported | Range Values | Comments |
|-------------------------------|-------------------|-----------|--------------|----------|
| 1                             | Message_ID        | yes       | 28           |          |
| 2                             | Message_Version   | yes       | 2            |          |
| 3                             | AV_Type           | yes       | 1            |          |
| 4                             | AV_Tail_Number    | yes       | standard     |          |
| 5                             | Mission_ID        | yes       | standard     |          |
| 6                             | Mission_Command.  | yes       | standard     |          |

| AV EOIR Command Message Field | Data Element Name                 | Supported | Range Values    | Comments  |
|-------------------------------|-----------------------------------|-----------|-----------------|---|
| 7                             | <b>EOIR_Identifier</b>            | yes       | standard        |   |
| 8                             | <b>EO_Power</b>                   | yes       | standard        |   |
| 9                             | <b>IR_Power</b>                   | yes       | standard        |   |
| 10                            | <b>EOIR_Payload_Active</b>        | yes       | standard        |   |
| 11                            | <b>EOIR_Payload_Pointing_Mode</b> | yes       | 0 <= x <= 1,3,4 |   |
| 12                            | <b>EOIR_Pointer_Latitude</b>      | yes       | standard        |   |
| 13                            | <b>EOIR_Pointer_Longitude</b>     | yes       | standard        |   |
| 14                            | <b>EOIR_Pointer_Altitude</b>      | yes       | standard        |   |
| 15                            | <b>EOIR_Depression</b>            | yes       | standard        |   |
| 16                            | <b>EOIR_Azimuth</b>               | yes       | standard        |   |
| 17                            | <b>EOIR_Depression_Rate</b>       | yes       | standard        |   |
| 18                            | <b>EOIR_Azimuth_Rate</b>          | yes       | standard        |   |
| 19                            | <b>EO_Payload_Camera_Select</b>   | yes       | 0 <= x <= 2     | 0 = None<br>1 = EO wide<br>2 = EO spotter   |
| 20                            | <b>EO_Payload_Zoom</b>            | yes       | standard        |   |
| 21                            | <b>EO_Payload_Focus</b>           | yes       | 0 <= x <= 100   |   |
| 22                            | <b>EO_Iris</b>                    | yes       | standard        |   |
| 23                            | <b>IR_Payload_Camera_Select</b>   | yes       | 0 <= x <= 1     | 0 = None<br>1 = IR  |
| 24                            | <b>IR_Payload_Zoom</b>            | yes       | standard        | 0<=x<16: 19mm<br>16<=x<33: 19mm with lens doubler<br>33<=x<50: 70mm<br>50<=x<67: 70mm with lens doubler<br>67<=x<84: 280mm<br>84<=x<=100: 280mm with lens doubler |
| 25                            | <b>IR_Payload_Focus</b>           | yes       | 0 <= x <= 100   |   |
| 26                            | <b>IR_Conrtast</b>                | yes       | standard        |   |
| 27                            | <b>IR_Gain</b>                    | yes       | standard        |   |
| 28                            | <b>IR_White_Hot</b>               | yes       | standard        |   |

| AV EOIR Command Message Field | Data Element Name                 | Supported | Range Values | Comments   |
|-------------------------------|-----------------------------------|-----------|--------------|--|
| 29                            | <b>IR_Auto_Gain_Recalibration</b> | yes       | standard     | Recalibration is performed each time the image doubler is enabled or disabled. Recalibration must be manually commanded by the operator as required. |

#### 7.1.2.7 AV Analog Video Command Message

| AV Analog Video Command Message Field | Data Element Name                    | Supported | Range Values | Comments |
|---------------------------------------|--------------------------------------|-----------|--------------|----------|
| 1                                     | <b>Message_ID</b>                    | yes       | standard     |          |
| 2                                     | <b>Message_Version</b>               | yes       | 2            |          |
| 3                                     | <b>AV_Type</b>                       | yes       | 1            |          |
| 4                                     | <b>AV_Tail_Number</b>                | yes       | standard     |          |
| 5                                     | <b>Mission_ID</b>                    | yes       | standard     |          |
| 6                                     | <b>Mission_Command.</b>              | yes       | standard     |          |
| 7                                     | <b>AV_Video_Mux_Power</b>            | yes       | standard     |          |
| 8                                     | <b>AV_Video_Downlink_Ch_1_Source</b> | yes       | standard     |          |
| 9                                     | <b>AV_Video_Downlink_Ch_2_Source</b> | yes       | standard     |          |
| 10                                    | <b>AV_Video_Downlink_Ch_3_Source</b> | no        | 0            |          |
| 11                                    | <b>AV_Video_Downlink_Ch_4_Source</b> | no        | 0            |          |
| 12                                    | <b>AV_VCR_Power_1</b>                | yes       | standard     |          |
| 13                                    | <b>AV_VCR_Mode_1</b>                 | yes       | standard     |          |
| 14                                    | <b>AV_VCR_Counter_Reset_1</b>        | yes       | standard     |          |
| 15                                    | <b>AV_VCR_Record_Source_1</b>        | yes       | standard     |          |

| AV Analog Video Command Message Field | Data Element Name          | Supported | Range Values | Comments |
|---------------------------------------|----------------------------|-----------|--------------|----------|
| 16                                    | AV_VCR_Power_2             | yes       | standard     |          |
| 17                                    | AV_VCR_Mode_2              | yes       | standard     |          |
| 18                                    | AV_VCR_Counter_Reset_2     | yes       | standard     |          |
| 19                                    | AV_VCR_Record_Source_2     | yes       | standard     |          |
| 20                                    | AV_VCR_Power_3             | yes       | standard     |          |
| 21                                    | AV_VCR_Mode_3              | yes       | standard     |          |
| 22                                    | AV_VCR_Counter_Reset_3     | yes       | standard     |          |
| 23                                    | AV_VCR_Record_Source_3     | yes       | standard     |          |
| 24                                    | AV_VCR_Power_4             | no        | 0            |          |
| 25                                    | AV_VCR_Mode_4              | no        | 0            |          |
| 26                                    | AV_VCR_Counter_Reset_4     | no        | 0            |          |
| 27                                    | AV_VCR_Record_Source_4     | no        | 0            |          |
| 28                                    | AV_Nose_Camera_Lens_Heater | yes       | standard     |          |

#### 7.1.2.8 AV Waypoint Begin Message

| AV Waypoint Begin Message Field | Data Element Name | Supported | Range Values | Comments |
|---------------------------------|-------------------|-----------|--------------|----------|
| 1                               | Message_ID        | yes       | standard     |          |
| 2                               | Message_Version   | yes       | 2            |          |
| 3                               | AV_Type           | yes       | standard     |          |
| 4                               | AV_Tail_Number    | yes       | standard     |          |
| 5                               | Mission_ID        | yes       | standard     |          |

| AV<br>Waypoint<br>Begin<br>Message<br>Field | Data Element Name                         | Supported | Range Values | Comments |
|---|---|-----------|--------------|----------|
| 6   | Mission_Command.                          | yes       | standard     |          |
| 7   | AV_Flight_Route_Plan_ID                   | yes       | standard     |          |
| 8   | AV_Waypoint_Number                        | yes       | standard     |          |
| 9   | AV_Number_Waypoints_In_Plan               | yes       | standard     |          |
| 10  | AV_Number_Commands_In_Waypoint            | yes       | standard     |          |
| 11  | AV_Waypoint_Emergency_Action              | yes       | standard     |          |
| 12  | AV_Emergency_Plan_Delay                   | yes       | standard     |          |
| 13  | AV_Emergency_Plan_Conditional_Select_Mode | no        | 0            |          |
| 14  | AV_Emergency_Plan_ID_1                    | yes       | standard     |          |
| 15  | AV_Emergency_Plan_ID_2                    | no        | 0            |          |
| 16  | AV_Emergency_Plan_ID_3                    | no        | 0            |          |
| 17  | AV_Emergency_Plan_ID_4                    | no        | 0            |          |

#### 7.1.2.9 AV Piston Engine Command Message

| AV Piston<br>Engine<br>Command<br>Message<br>Field | Data Element Name | Supported | Range Values | Comments |
|--|-------------------|-----------|--------------|----------|
| 1  | Message_ID        | yes       | standard     |          |
| 2  | Message_Version   | yes       | 2            |          |
| 3  | AV_Type           | yes       | standard     |          |

| AV Piston Engine Command Message Field | Data Element Name                    | Supported | Range Values      | Comments |
|--|--------------------------------------|-----------|-------------------|----------|
| 4                                      | <b>AV_Tail_Number</b>                | yes       | standard          |          |
| 5                                      | <b>Mission_ID</b>                    | yes       | standard          |          |
| 6                                      | <b>Mission_Command.</b>              | yes       | standard          |          |
| 7                                      | <b>Engine_ID</b>                     | yes       | 2                 |          |
| 8                                      | <b>Engine_Speed_Hold</b>             | yes       | standard          |          |
| 9                                      | <b>Engine_Speed</b>                  | yes       | 3000 <= x <= 5800 |          |
| 10                                     | <b>Engine_Start</b>                  | no        | 0                 |          |
| 11                                     | <b>Engine_Enable_Toggle</b>          | yes       | standard          |          |
| 12                                     | <b>Engine_Cooling_Fan</b>            | yes       | standard          |          |
| 13                                     | <b>Engine_Ignition_Coil_1_Enable</b> | yes       | standard          |          |
| 14                                     | <b>Engine_Ignition_Coil_2_Enable</b> | yes       | standard          |          |

#### 7.1.2.10 AV IFF Command Message

| AV IFF Command Message Field | Data Element Name       | Supported | Range Values | Comments |
|------------------------------|-------------------------|-----------|--------------|----------|
| 1                            | <b>Message_ID</b>       | yes       | standard     |          |
| 2                            | <b>Message_Version</b>  | yes       | 2            |          |
| 3                            | <b>AV_Type</b>          | yes       | 1            |          |
| 4                            | <b>AV_Tail_Number</b>   | yes       | standard     |          |
| 5                            | <b>Mission_ID</b>       | yes       | standard     |          |
| 6                            | <b>Mission_Command.</b> | yes       | standard     |          |
| 7                            | <b>AVIFF_Power</b>      | yes       | standard     |          |
| 8                            | <b>AVIFF_Mode_C</b>     | yes       | standard     |          |

| AV IFF Command Message Field | Data Element Name       | Supported | Range Values | Comments |
|------------------------------|-------------------------|-----------|--------------|----------|
| 9                            | AV_IFF_Mode_1           | yes       | standard     |          |
| 10                           | AV_IFF_Mode_1_Code      | yes       | standard     |          |
| 11                           | AV_IFF_Mode_2           | yes       | standard     |          |
| 12                           | AV_IFF_Mode_3A          | yes       | standard     |          |
| 13                           | AV_IFF_Mode_3A_Code     | yes       | standard     |          |
| 14                           | AV_IFF_Mode_4           | yes       | standard     |          |
| 15                           | AV_IFF_Mode_4_Code      | yes       | standard     |          |
| 16                           | AV_IFF_Mode_4_Hold      | yes       | standard     |          |
| 17                           | AV_IFF_Operational_Mode | yes       | standard     |          |

#### 7.1.2.11 AV Fuel System Command Message

| AV Fuel System Command Message Field | Data Element Name | Supported | Range Values | Comments                         |
|--------------------------------------|-------------------|-----------|--------------|----------------------------------|
| 1                                    | Message_ID        | yes       | standard     |                                  |
| 2                                    | Message_Version   | yes       | 2            |                                  |
| 3                                    | AV_Type           | yes       | 1            |                                  |
| 4                                    | AV_Tail_Number    | yes       | standard     |                                  |
| 5                                    | Mission_ID        | yes       | standard     |                                  |
| 6                                    | Mission_Command.  | yes       | standard     |                                  |
| 7                                    | Fuel_Tank_ID      | yes       | 0 <= x <= 1  | 0 = Forward tank<br>1 = Aft tank |

| AV Fuel System Command Message Field | Data Element Name                 | Supported | Range Values   | Comments   |
|--------------------------------------|-----------------------------------|-----------|--|--|
| 8                                    | AV_Engine_1_Fuel_Source_Tank      | yes       | standard   | If one tank is set to automatic selection then all tanks will be set to automatic selection. |
| 9                                    | AV_Engine_2_Fuel_Source_Tank      | no        | 0  |  |
| 10                                   | AV_Fuel_Tank_Transfer_Rate        | no        | 0  |  |
| 11                                   | AV_Fuel_Transfer_Source_Tank      | no        | 0  |  |
| 12                                   | AV_Fuel_Transfer_Destination_Tank | no        | 0  |  |
| 13                                   | AV_Fuel_Start_Of_Flight           | yes       | if Fuel_Tank_ID = 0, 0 <= x <= 402<br>if_Fuel_Tank_ID = 1, 0 <= x <= 263 |  |

#### 7.1.2.12 Ground Line of Sight Datalink Control Message

| Ground Line of Sight Datalink Control Message Field | Data Element Name | Supported | Range Values | Comments |
|---|-------------------|-----------|--------------|----------|
| 1   | Message_ID        | yes       | standard     |          |
| 2   | Message_Version   | yes       | 2            |          |
| 3   | AV_Type           | yes       | standard     |          |

| Ground Line of Sight Datalink Control Message Field | Data Element Name                      | Supported | Range Values | Comments  |
|---|--|-----------|--------------|---|
| 4   | <b>AV_Tail_Number</b>                  | yes       | standard     |   |
| 5   | <b>Mission_ID</b>                      | yes       | standard     |   |
| 6   | <b>Mission_Command.</b>                | yes       | standard     |   |
| 7   | <b>LOS_GDT_Uplink_Power_1</b>          | yes       | x = 0,1,10   | 0 = Do not transmit<br>1 = Low Power<br>10 = High Power |
| 8   | <b>LOS_GDT_Uplink_Power_2</b>          | yes       | x = 0,1,10   | 0 = Do not transmit<br>1 = Low Power<br>10 = High Power |
| 9   | <b>LOS_GDT_Uplink_Frequency_1</b>      | yes       | standard     |   |
| 10  | <b>LOS_GDT_Uplink_Frequency_2</b>      | yes       | standard     |   |
| 11  | <b>LOS_GDT_Downlink_Frequency_1</b>    | yes       | standard     |   |
| 12  | <b>LOS_GDT_Downlink_Frequency_2</b>    | yes       | standard     |   |
| 13  | <b>LOS_GDT_Transmitter_Selected</b>    | yes       | standard     |   |
| 14  | <b>LOS_GDT_Cooling_Mode</b>            | yes       | standard     |   |
| 15  | <b>LOS_GDT_Power</b>                   | yes       | standard     |   |
| 16  | <b>LOS_GDT_Transmit_Antenna_Select</b> | yes       | standard     |   |
| 17  | <b>LOS_GDT_Receive_Antenna_Select</b>  | yes       | standard     |   |
| 18  | <b>LOS_GDT_Tracking_Mode</b>           | yes       | standard     |   |
| 19  | <b>LOS_GDT_Pointing_Azimuth</b>        | yes       | standard     |   |
| 20  | <b>LOS_GDT_Pointing_Elevation</b>      | yes       | standard     |   |

### 7.1.2.13 Airborne Line of Sight Datalink Control Message

| Airborne Line of Sight Datalink Control Message Field | Data Element Name                    | Supported | Range Values | Comments |
|---|--------------------------------------|-----------|--------------|----------|
| 1   | <b>Message_ID</b>                    | yes       | standard     |          |
| 2   | <b>Message_Version</b>               | yes       | 2            |          |
| 3   | <b>AV_Type</b>                       | yes       | standard     |          |
| 4   | <b>AV_Tail_Number</b>                | yes       | standard     |          |
| 5   | <b>Mission_ID</b>                    | yes       | standard     |          |
| 6   | <b>Mission_Command.</b>              | yes       | standard     |          |
| 7   | <b>AV_LOS_Ch_1_Uplink_Freq</b>       | yes       | standard     |          |
| 8   | <b>AV_LOS_Ch_2_Uplink_Freq</b>       | yes       | standard     |          |
| 9   | <b>AV_LOS_Ch_1_Downlink_Freq</b>     | yes       | standard     |          |
| 10  | <b>AV_LOS_Ch_2_Downlink_Freq</b>     | yes       | standard     |          |
| 11  | <b>AV_LOS_ADT_Antenna_Selected</b>   | yes       | standard     |          |
| 12  | <b>AV_LOS_ADT_Pointing_Mode</b>      | yes       | standard     |          |
| 13  | <b>AV_LOS_Pointing_Azimuth</b>       | yes       | standard     |          |
| 14  | <b>AV_LOS_Pointing_Elevation</b>     | yes       | standard     |          |
| 15  | <b>AV_LOS_ADT_Transmitter_1_Mode</b> | yes       | standard     |          |
| 16  | <b>AV_LOS_ADT_Transmitter_2_Mode</b> | yes       | standard     |          |
| 17  | <b>AV_LOS_ADT_Tx_1_Power</b>         | yes       | standard     |          |
| 18  | <b>AV_LOS_ADT_Tx_2_Power</b>         | yes       | standard     |          |

### 7.1.2.14 Airborne SATCOM Datalink Control Message

| Airborne SATCOM Datalink Control Message Field | Data Element Name                           | Supported | Range Values | Comments |
|--|---|-----------|--------------|----------|
| 1  | <b>Message_ID</b>                           | yes       | standard     |          |
| 2  | <b>Message_Version</b>                      | yes       | 2            |          |
| 3  | <b>AV_Type</b>                              | yes       | standard     |          |
| 4  | <b>AV_Tail_Number</b>                       | yes       | standard     |          |
| 5  | <b>Mission_ID</b>                           | yes       | standard     |          |
| 6  | <b>Mission_Command.</b>                     | yes       | standard     |          |
|  | <b>The contents of this message is TBD.</b> |           |              |          |

## **8. Outrider specific appendix**

This section discusses the Outrider specific implementation of the AV Standard interface. It includes information on which messages and fields are supported by Outrider and any Outrider specific range values if applicable.

### **8.1 Outrider supported messages**

Outrider supports the following messages and fields.  
All fields that are not supported shall be set to zero.

### 8.1.1 Outrider DCM to TCS Messages

#### ODCM to TCS Messages

| Message Name   | Message ID | Supported | Frequency | Length | TCP/IP Overhead | Bandwidth |
|--|------------|-----------|-----------|--------|-----------------|-----------|
| AV Position Status Message                           | 1          | yes       | 8         | 252    | 40              | 2336      |
| AV INS Status Message                                | 2          | yes       | 8         | 192    | 40              | 1856      |
| AV GPS Status Message                                | 3          | no        | 0         |        |                 | 0         |
| AV EOIR Status Message                               | 4          | yes       | 10        | 212    | 40              | 2520      |
| AV Line of Sight Ground Data Terminal Status Message | 5          | yes       | 1         | 200    | 40              | 240       |
| AV Line of Sight Air Data Terminal Status Message    | 6          | yes       | 1         | 140    | 40              | 180       |
| AV Piston Engine Status Message                      | 7          | yes       | 1         | 204    | 40              | 244       |
| AV Fuel Status Message                               | 8          | yes       | 1         | 68     | 40              | 108       |
| AV Electrical System Status Message                  | 9          | yes       | 1         | 112    | 40              | 152       |
| AV Analog Video System Status Message                | 10         | no        | 0         |        |                 | 0         |
| AV Lights and Landing Gear Status Message            | 11         | yes       | 1         | 60     | 40              | 100       |
| AV IFF Status Message                                | 12         | no        | 0         |        |                 | 0         |
| AV SAR Status Message                                | 15         | no        | 0         |        |                 | 0         |
| AV Warning Message                                   | 19         | yes       | Max 4 Hz  | 236    | 40              | 1104      |
| DCM Protocol Error Message                           | 37         | yes       | As Needed | 168    | 40              | 208       |
| DCM Mission Load Acknowledge Message                 | 38         | yes       | As Needed | 44     | 40              | 84        |
| AV Servo Status Message                              | 39         | no        | 0         |        |                 | 0         |

Table 8.1.1-1 ODCM to TCS Messages

### 8.1.1.1 AV Position Status Message

| AV Position Status Message Field | Data Element Name                      | Supported | Range Values | Comments                       |
|----------------------------------|--|-----------|--------------|--------------------------------|
| 1                                | <b>Message_ID</b>                      | yes       | 1            | 1 = AV Position Status Message |
| 2                                | <b>Message_Version</b>                 | yes       | 2            |                                |
| 3                                | <b>AV_Type</b>                         | yes       | 2            | 2 = Outrider                   |
| 4                                | <b>AV_Tail_Number</b>                  | yes       | standard     |                                |
| 5                                | <b>Mission_ID</b>                      | yes       | standard     |                                |
| 6                                | <b>AV_Current_Nav_Altitude_Source.</b> | yes       | 2 <= x <= 3  | 2 = GPS<br>3 = INS (IMU)       |
| 7                                | <b>AV_Altitude</b>                     | yes       | standard     |                                |
| 8                                | <b>AV_Climb_Rate</b>                   | yes       | standard     |                                |
| 9                                | <b>AV_Current_Nav_Position_Source</b>  | yes       | standard     | 1 = INS (IMU)                  |
| 10                               | <b>AV_Latitude</b>                     | yes       | standard     |                                |
| 11                               | <b>AV_Longitude</b>                    | yes       | standard     |                                |
| 12                               | <b>AV_NAV_Orientation_Source</b>       | yes       | 1            | 1 = INS (IMU)                  |
| 13                               | <b>AV_Roll</b>                         | yes       | standard     |                                |
| 14                               | <b>AV_Pitch</b>                        | yes       | standard     |                                |
| 15                               | <b>AV_Heading</b>                      | yes       | standard     |                                |
| 16                               | <b>AV_Pitch_Rate</b>                   | yes       | standard     |                                |
| 17                               | <b>AV_Roll_Rate</b>                    | yes       | standard     |                                |
| 18                               | <b>AV_Yaw_Rate</b>                     | yes       | standard     |                                |
| 19                               | <b>AV_Angle_Of_Attack_1</b>            | no        | 0            |                                |
| 20                               | <b>AV_Angle_Of_Attack_2</b>            | no        | 0            |                                |
| 21                               | <b>AV_AOA_Sensor_Active</b>            | no        | 0            |                                |
| 22                               | <b>AV_GPS_Time_Week</b>                | no        | 0            |                                |
| 23                               | <b>AV_GPS_Time_Second</b>              | no        | 0            |                                |
| 24                               | <b>AV_GPS_Time_Ns</b>                  | no        | 0            |                                |

| AV Position Status Message Field | Data Element Name         | Supported | Range Values     | Comments                               |
|----------------------------------|---------------------------|-----------|------------------|--|
| 25                               | AV_Baro_Altitude          | yes       | 0 <= x <= 15000  |  |
| 26                               | AV_Radar_Altitude         | no        | 0                |  |
| 27                               | AV_Magnetometer_Heading   | no        | 0                |  |
| 28                               | AV_Ground_Track           | yes       | standard         | Computed at ODCM.                      |
| 29                               | AV_Ground_Speed           | yes       | 0 <= x <= 255    | Computed at ODCM.                      |
| 30                               | AV_Airspeed_1             | yes       | standard         | Outrider has only one airspeed source. |
| 31                               | AV_Airspeed_2             | no        | 0                |  |
| 32                               | AV_Airspeed_Sensor_Active | yes       | 1                |  |
| 33                               | AV_Measured_Wind_Heading  | no        | 0                |  |
| 34                               | AV_Measured_Wind_Speed    | no        | 0                |  |
| 35                               | AV_Nav_Mode               | yes       | 1 <= x <= 6,8    | 8 = Camera guide mode                  |
| 36                               | AV_Next_Waypoint          | yes       | 0 <= x <= 99     |  |
|                                  | AV_TTG_Next_Waypoint      | yes       | standard         |  |
|                                  | AV_Air_Temperature        | yes       | -200 <= x <= 200 |  |

### 8.1.1.2 AV INS Status Message

This message is only provided by Outrider when the INS (IMU) is the current position source for navigation. It is not provided when the AV is navigating by GPS or magnetometer.

| AV INS Status Message Field | Data Element Name | Supported | Range Values | Comments |
|-----------------------------|-------------------|-----------|--------------|----------|
| 1                           | Message_ID        | yes       | 2            |          |
| 2                           | Message_Version   | yes       | 2            |          |

| AV INS Status Message Field | Data Element Name            | Supported | Range Values           | Comments   |
|-----------------------------|------------------------------|-----------|------------------------|--|
| 3                           | AV_Type                      | yes       | 2                      |  |
| 4                           | AV_Tail_Number               | yes       | standard               |  |
| 5                           | Mission_ID                   | yes       | standard               |  |
| 6                           | AV_INS_Er_NS                 | no        | 0                      |  |
| 7                           | AV_INS_Er_EW                 | no        | 0                      |  |
| 8                           | AV_INS_Er_Alt                | no        | 0                      |  |
| 9                           | AV_INS_Mode                  | yes       | 1 <= x <= 7            | 1 = IMU/DGPS – IMU with differential GPS<br>2 = IBLS/DGPS – IBLS with differential GPS<br>3 = IMU/GPS – IMU with normal GPS<br>4 = IBLS/GPS – IBLS with normal GPS<br>5 = IMU dead reckoning – IMU without GPS aiding<br>6 = ACP dead reckoning – Autopilot without IMU or GPS<br>7 = GCS Nav – Ground Control Station is tracking the air vehicle using the GDT |
| 10                          | AV_INS_Alt                   | yes       | -2,000 <= x <= 100,000 |  |
| 11                          | AV_INS_Lat                   | yes       | standard               |  |
| 12                          | AV_INS_Lon.                  | yes       | standard               |  |
| 13                          | AV_INS_East_Velocity         | yes       | standard               |  |
| 14                          | AV_INS_North_Velocity        | yes       | standard               |  |
| 15                          | AV_INS_Altitude_Velocity     | yes       | standard               |  |
| 16                          | AV_INS_East_Acceleration     | yes       | standard               |  |
| 17                          | AV_INS_North_Acceleration    | yes       | standard               |  |
| 18                          | AV_INS_Altitude_Acceleration | yes       | standard               |  |
| 19                          | AV_INS_Pitch                 | yes       | standard               |  |
| 20                          | AV_INS_Roll                  | yes       | standard               |  |
| 21                          | AV_INS_Heading               | yes       | standard               |  |
| 22                          | AV_INS_Pitch_Rate            | yes       | standard               |  |
| 23                          | AV_INS_Roll_Rate             | yes       | standard               |  |

| AV INS Status Message Field | Data Element Name  | Supported | Range Values | Comments |
|-----------------------------|--------------------|-----------|--------------|----------|
| 24                          | AV_INS_Yaw_Rate    | yes       | standard     |          |
| 25                          | AV_INS_Time_Week   | no        | 0            |          |
| 26                          | AV_INS_Time_Second | no        | 0            |          |
| 27                          | AV_INS_Time_Ns     | no        | 0            |          |

### 8.1.1.3 AV GPS Status Message

Outrider does not support the AV GPS Status Message.

### 8.1.1.4 AV EOIR Status Message

| AV EOIR Status Message Field | Data Element Name          | Supported | Range Values | Comments                                    |
|------------------------------|----------------------------|-----------|--------------|---|
| 1                            | Message_ID                 | yes       | 4            |   |
| 2                            | Message_Version            | yes       | 2            |   |
| 3                            | AV_Type.                   | yes       | 2            |   |
| 4                            | AV_Tail_Number             | yes       | standard     |   |
| 5                            | Mission_ID                 | yes       | standard     |   |
| 6                            | PL_ID                      | yes       | 0 <= x <= 1  | 0 = No EO/IR Payload<br>1 = POP 100 Payload |
| 7                            | PL_Active_Sensor           | yes       | standard     |   |
| 8                            | EO_Payload_Camera_Selected | yes       | 0 <= x <= 1  | 0 = None<br>1 = EO                          |
| 9                            | PL_Active_Sensor_Status    | yes       | standard     |   |
| 10                           | PL_Pointing_Mode           | yes       | 0 <= x <= 1  |   |

| AV EOIR Status Message Field | Data Element Name                      | Supported | Range Values | Comments   |
|------------------------------|--|-----------|--------------|--|
| 11                           | <b>PL_Pointer_Lat</b>                  | yes       | standard     |  |
| 12                           | <b>PL_Pointer_Lon</b>                  | yes       | standard     |  |
| 13                           | <b>PL_Depression_Angle</b>             | yes       | standard     |  |
| 14                           | <b>PL_Azimuth_Angle</b>                | yes       | standard     |  |
| 15                           | <b>PL_Depression_Rate</b>              | yes       | standard     |  |
| 16                           | <b>PL_Azimuth_Rate</b>                 | yes       | standard     |  |
| 17                           | <b>PL_LOS_Range_to_Target</b>          | no        | 0            |  |
| 18                           | <b>PL_Ground_Range_to_Target</b>       | no        | 0            |  |
| 19                           | <b>PL_Focal_Length</b>                 | yes       | standard     |  |
| 20                           | <b>PL_FOV_Horizontal</b>               | yes       | standard     |  |
| 21                           | <b>PL_FOV_Vertical</b>                 | yes       | standard     |  |
| 22                           | <b>PL_IR_Polarity</b>                  | yes       | standard     |  |
| 23                           | <b>PL_IR_Gain</b>                      | no        | 0            |  |
| 24                           | <b>PL_Image_Ang_to_North</b>           | yes       | standard     |  |
| 25                           | <b>PL_Image_Datum</b>                  | yes       | standard     |  |
| 26                           | <b>PL_Image_Category</b>               | yes       | standard     |  |
| 27                           | <b>PL_Image_Obliquity_Angle</b>        | no        | 0            |  |
| 28                           | <b>PL_Center_Point_Accuracy</b>        | no        | 0            |  |
| 29                           | <b>PL_Center_Point_Lat</b>             | yes       | standard     | Calculations are in the ODCM and use DTED data if available. |
| 30                           | <b>PL_Center_Point_Lon</b>             | yes       | standard     | Calculations are in the ODCM and use DTED data if available. |
| 31                           | <b>PL_Image_Collection_Time_Week</b>   | no        | 0            |  |
| 32                           | <b>PL_Image_Collection_Time_Second</b> | no        | 0            |  |
| 33                           | <b>PL_Image_Collection_Time_Ns</b>     | no        | 0            |  |

### 8.1.1.5 AV Line of Sight Ground Data Terminal Status Message

| AV Line of Sight Ground Data Terminal Status Message Field | Data Element Name                | Supported | Range Values | Comments |
|--|----------------------------------|-----------|--------------|----------|
| 1  | <b>Message_ID</b>                | yes       | standard     |          |
| 2  | <b>Message_Version</b>           | yes       | 2            |          |
| 3  | <b>AV_Type</b>                   | yes       | 2            |          |
| 4  | <b>AV_Tail_Number</b>            | yes       | standard     |          |
| 5  | <b>Mission_ID</b>                | yes       | standard     |          |
| 6  | <b>LOS_GDT_ID</b>                | yes       | standard     |          |
| 7  | <b>LOS_GDT_Signal_Strength_1</b> | yes       | standard     |          |
| 8  | <b>LOS_GDT_Signal_Strength_2</b> | no        | 0            |          |
| 9  | <b>LOS_GDT_PLL_Status_1</b>      | yes       | standard     |          |
| 10   | <b>LOS_GDT_PLL_Status_2</b>      | no        | 0            |          |
| 11   | <b>LOS_GDT_Carrier_Detect_1</b>  | yes       | standard     |          |
| 12   | <b>LOS_GDT_Carrier_Detect_2</b>  | no        | 0            |          |
| 13   | <b>LOS_GDT_Range</b>             | yes       | standard     |          |
| 14   | <b>LOS_GDT_Uplink_Power_1</b>    | yes       | 0<= x <= 10  |          |
| 15   | <b>LOS_GDT_Uplink_Power_2</b>    | no        | 0            |          |
| 16   | <b>LOS_GDT_CPU_Temp</b>          | no        | 0            |          |
| 17   | <b>LOS_GDT_TX1_Temp</b>          | no        | 0            |          |
| 18   | <b>LOS_GDT_TX2_Temp</b>          | no        | 0            |          |
| 19   | <b>LOS_GDT_TX1_Power_Temp</b>    | no        | 0            |          |
| 20   | <b>LOS_GDT_TX2_Power_Temp</b>    | no        | 0            |          |
| 21   | <b>LOS_GDT_TX1_Uplink_Freq</b>   | yes       | standard     |          |
| 22   | <b>LOS_GDT_TX2_Uplink_Freq</b>   | no        | 0            |          |
| 23   | <b>LOS_GDT_RX1_Downlink_Freq</b> | yes       | standard     |          |
| 24   | <b>LOS_GDT_RX2_Downlink_Freq</b> | no        | 0            |          |

| AV Line of Sight Ground Data Terminal Status Message Field | Data Element Name                   | Supported | Range Values | Comments                                  |
|--|-------------------------------------|-----------|--------------|---|
| 25   | <b>LOS_GDT_Transmitter_Selected</b> | yes       | 1            | Outrider has 1 GDT transmitter            |
| 26   | <b>LOS_GDT_Cooling_Mode</b>         | no        | 0            |   |
| 27   | <b>LOS_GDT_28V_Power_Level</b>      | no        | 0            |   |
| 28   | <b>LOS_GDT_Serial_Comm_Errors</b>   | no        | 0            |   |
| 29   | <b>LOS_GDT_Antenna_Selected</b>     | yes       | 2            | Outrider GDT has directional antenna only |
| 30   | <b>LOS_GDT_Pointing_Azimuth</b>     | yes       | standard     |   |
| 31   | <b>LOS_GDT_Pointing_Elevation</b>   | yes       | standard     |   |
| 32   | <b>LOS_GDT_Tracking_Mode</b>        | yes       | standard     |   |

#### 8.1.1.6 AV Line of Sight Air Data Terminal Status Message

| AV Line of Sight Air Data Terminal Status Message Field | Data Element Name              | Supported | Range Values      | Comments |
|---|--------------------------------|-----------|-------------------|----------|
| 1   | <b>Message_ID</b>              | yes       | 6                 |          |
| 2   | <b>Message_Version</b>         | yes       | 2                 |          |
| 3   | <b>AV_Type</b>                 | yes       | 2                 |          |
| 4   | <b>AV_Tail_Number</b>          | yes       | standard          |          |
| 5   | <b>Mission_ID</b>              | yes       | standard          |          |
| 6   | <b>AV_LOS_Data_Link_Active</b> | yes       | 1                 |          |
| 7   | <b>AV_LOS_Ch_1_Uplink_Freq</b> | yes       | 4400 <= x <= 4625 |          |

| AV Line of Sight Air Data Terminal Status Message Field | Data Element Name             | Supported | Range Values      | Comments |
|---|-------------------------------|-----------|-------------------|----------|
| 8   | AV_LOS_Ch_2_Uplink_Freq       | no        | 0                 |          |
| 9   | AV_LOS_Ch_1_Downlink_Freq     | yes       | 4775 <= x <= 4999 |          |
| 10  | AV_LOS_Ch_2_Downlink_Freq     | no        | 0                 |          |
| 11  | AV_LOS_ADT_Antenna_Selected   | yes       | 1,4,5             |          |
| 12  | AV_LOS_ADT_Ant_Select_Mode    | yes       | standard          |          |
| 13  | AV_LOS_Pointing_Azimuth       | yes       | standard          |          |
| 14  | AV_LOS_Pointing_Elevation     | yes       | standard          |          |
| 15  | AV_LOS_ADT_Transmitter_1_Stat | yes       | 0,3               |          |
| 16  | AV_LOS_ADT_Transmitter_2_Stat | no        | 0                 |          |
| 17  | AV_LOS_ADT_Tx_1_Power         | yes       | standard          |          |
| 18  | AV_LOS_ADT_Tx_2_Power         | no        | 0                 |          |
| 19  | AV_LOS_Receiver_1_Status      | yes       | 0,2               |          |
| 20  | AV_LOS_Receiver_2_Status      | no        | 0                 |          |
| 21  | AV_LOS_Sgnl_Strngth_1         | yes       | standard          |          |
| 22  | AV_LOS_Sgnl_Strngth_2         | no        | 0                 |          |
| 23  | AV_LOS_Rcvr_1_Cumul_Err       | no        | 0                 |          |
| 24  | AV_LOS_Rcvr_2_Cumul_Err       | no        | 0                 |          |

### 8.1.1.7 AV Piston Engine Status Message

| AV Piston Engine Status Message Field | Data Element Name | Supported | Range Values | Comments |
|---------------------------------------|-------------------|-----------|--------------|----------|
|                                       |                   |           |              |          |

| AV Piston<br>Engine<br>Status<br>Message<br>Field | Data Element Name                        | Supported | Range Values   | Comments   |
|---|--|-----------|----------------|--|
| 1   | <b>Message_ID</b>                        | yes       | 7              |  |
| 2   | <b>Message_Version</b>                   | yes       | 2              |  |
| 3   | <b>AV_Type</b>                           | yes       | 2              |  |
| 4   | <b>AV_Tail_Number</b>                    | yes       | standard       |  |
| 5   | <b>Mission_ID</b>                        | yes       | standard       |  |
| 6   | <b>Engine_ID</b>                         | yes       | 2              |  |
| 7   | <b>Engine_Status</b>                     | yes       | 0,2            |  |
| 8   | <b>Engine_Speed</b>                      | yes       | 0 <= x <= 6000 |  |
| 9   | <b>Engine_Throttle_Actuator_Position</b> | yes       | standard       |  |
| 10  | <b>Engine_Oil_Pressure</b>               | no        | 0              |  |
| 11  | <b>Engine_Coolant_Pressure</b>           | no        | 0              |  |
| 12  | <b>Engine_Manifold_Pressure</b>          | no        | 0              |  |
| 13  | <b>Engine_Fuel_Pressure</b>              | yes       | standard       |  |
| 14  | <b>Engine_Oil_Temperature</b>            | no        | 0              |  |
| 15  | <b>Engine_Coolant_Temperature</b>        | no        | 0              |  |
| 16  | <b>Engine_Exhaust_Temperature_1</b>      | yes       | standard       |  |
| 17  | <b>Engine_Exhaust_Temperature_2</b>      | yes       | standard       |  |
| 18  | <b>Engine_Exhaust_Temperature_3</b>      | no        | 0              |  |
| 19  | <b>Engine_Exhaust_Temperature_4</b>      | no        | 0              |  |
| 20  | <b>Engine_Cyl_Head_Temperature</b>       | yes       | standard       | This data element is the average of the 4 thermocouples in the Outrider engine |
| 21  | <b>Engine_Manifold_Temperature</b>       | yes       | standard       |  |
| 22  | <b>Engine_Turbo_Oil_Temperature</b>      | no        | 0              |  |
| 23  | <b>Engine_Oil_Level</b>                  | no        | 0              |  |
| 24  | <b>Engine_Fuel_Tank_Selected</b>         | yes       | 1              | Outrider has only 1 fuel tank  |
| 25  | <b>Engine_Alternator_Current</b>         | no        | 0              |  |
| 26  | <b>Engine_Alternator_Voltage</b>         | yes       | 0 <= x <= 400  |  |
| 27  | <b>Engine_Alternator_Temperature</b>     | no        | 0              |  |
| 28  | <b>Engine_Cooling_Fan_Status</b>         | no        | 0              |  |

| AV Piston Engine Status Message Field | Data Element Name                     | Supported | Range Values | Comments |
|---------------------------------------|---------------------------------------|-----------|--------------|----------|
| 29                                    | <u>Engine_Ignition_Coil_1_Enabled</u> | no        | 0            |          |
| 30                                    | <u>Engine_Ignition_Coil_2_Enabled</u> | no        | 0            |          |

#### 8.1.1.8 AV Fuel Status Message

| AV Fuel Status Message Field | Data Element Name              | Supported | Range Values | Comments                      |
|------------------------------|--------------------------------|-----------|--------------|-------------------------------|
| 1                            | <u>Message_ID</u>              | yes       | 8            |                               |
| 2                            | <u>Message_Version</u>         | yes       | 2            |                               |
| 3                            | <u>AV_Type</u>                 | yes       | 2            |                               |
| 4                            | <u>AV_Tail_Number</u>          | yes       | standard     |                               |
| 5                            | <u>Mission_ID</u>              | yes       | standard     |                               |
| 6                            | <u>Fuel_Tank_ID</u>            | yes       | 1            | Outrider has only 1 fuel tank |
| 7                            | <u>Fuel_Tank_Current_Level</u> | yes       | 0 <= x <= 80 | Computed by ODCM              |
| 8                            | <u>Fuel_Tank_Flow_Rate_Out</u> | yes       | standard     | Computed by ODCM              |
| 9                            | <u>Fuel_Tank_Flow_Rate_In</u>  | no        | 0            |                               |
| 10                           | <u>Fuel_Tank_Pressure</u>      | no        | 0            |                               |

#### 8.1.1.9 AV Electrical System Status Message

| AV Electrical System Status Message Field | Data Element Name    | Supported | Range Values | Comments |
|---|----------------------|-----------|--------------|----------|
| 1   | Message_ID           | yes       | 9            |          |
| 2   | Message_Version      | yes       | 2            |          |
| 3   | AV_Type              | yes       | 2            |          |
| 4   | AV_Tail_Number       | yes       | standard     |          |
| 5   | Mission_ID           | yes       | standard     |          |
| 6   | AV_40VDC_Bus_Voltage | no        | 0            |          |
| 7   | AV_28VDC_Bus_Voltage | no        | 0            |          |
| 8   | AV_Battery_Voltage_1 | yes       | standard     |          |
| 9   | AV_Battery_Current_1 | no        | 0            |          |
| 10  | AV_Battery_Voltage_2 | no        | 0            |          |
| 11  | AV_Battery_Current_2 | no        | 0            |          |
| 12  | AV_Battery_Voltage_3 | no        | 0            |          |
| 13  | AV_Battery_Current_3 | no        | 0            |          |
| 14  | AV_Battery_Voltage_4 | no        | 0            |          |
| 15  | AV_Battery_Current_4 | no        | 0            |          |

#### 8.1.1.10 AV Analog Video System Status Message

Outrider does not support this message.

#### 8.1.1.11 AV Lights and Landing Gear Status Message

| AV Lights and Landing Gear Status Message Field | Data Element Name                | Supported | Range Values    | Comments |
|---|----------------------------------|-----------|-----------------|----------|
| 1   | <b>Message_ID</b>                | yes       | 11              |          |
| 2   | <b>Message_Version</b>           | yes       | 2               |          |
| 3   | <b>AV_Type</b>                   | yes       | 2               |          |
| 4   | <b>AV_Tail_Number</b>            | yes       | standard        |          |
| 5   | <b>Mission_ID</b>                | yes       | 1 <= x <= 65535 |          |
| 6   | <b>AV_Navigation_Lights</b>      | yes       | standard        |          |
| 7   | <b>AV_Landing_Lights</b>         | no        | 0               |          |
| 8   | <b>AV_Strobe_Light</b>           | yes       | standard        |          |
| 9   | <b>AV_Hazard_Beacon</b>          | no        | 0               |          |
| 10  | <b>AV_Nose_Landing_Gear</b>      | yes       | 1               |          |
| 11  | <b>AV_Port_Landing_Gear</b>      | yes       | 1               |          |
| 12  | <b>AV_Starboard_Landing_Gear</b> | yes       | 1               |          |

#### 8.1.1.12 AV IFF Status Message

| AV IFF Status Message Field | Data Element Name      | Supported | Range Values | Comments |
|-----------------------------|------------------------|-----------|--------------|----------|
| 1                           | <b>Message_ID</b>      | yes       | 12           |          |
| 2                           | <b>Message_Version</b> | yes       | 2            |          |
| 3                           | <b>AV_Type</b>         | yes       | 2            |          |
| 4                           | <b>AV_Tail_Number</b>  | yes       | standard     |          |
| 5                           | <b>Mission_ID</b>      | yes       | standard     |          |

| AV IFF Status Message Field | Data Element Name       | Supported | Range Values | Comments           |
|-----------------------------|-------------------------|-----------|--------------|--------------------|
| 6                           | AV_IFF_Power            | no        | 0            |                    |
| 7                           | AV_IFF_Identity         | yes       | standard     |                    |
| 8                           | AV_IFF_Mode_C           | yes       | standard     |                    |
| 9                           | AV_IFF_Mode_1           | no        | 0            |                    |
| 10                          | AV_IFF_Mode_1_Code      | no        | 0            |                    |
| 11                          | AV_IFF_Mode_2           | no        | 0            |                    |
| 12                          | AV_IFF_Mode_3A          | yes       | standard     |                    |
| 13                          | AV_IFF_Mode_3A_Code     | no        | 0            | Manual entry on AV |
| 14                          | AV_IFF_Mode_4           | no        | 0            |                    |
| 15                          | AV_IFF_Mode_4_Code      | no        | 0            |                    |
| 16                          | AV_IFF_Mode_4_Hold      | no        | 0            |                    |
| 17                          | AV_IFF_Operational_Mode | yes       | standard     |                    |

### 8.1.1.13 AV SAR Status Message

Outrider does not support this message.

### 8.1.1.14 AV Warning Message

| AV Warning Message Field | Data Element    | Supported | Range Values | Comments |
|--------------------------|-----------------|-----------|--------------|----------|
| 1                        | Message_ID      | yes       | 19           |          |
| 2                        | AV_Type         | yes       | 2            |          |
| 3                        | Message_Version | yes       | 2            |          |
| 4                        | AV_Tail_Number  | yes       | standard     |          |

| AV Warning Message Field | Data Element                   | Supported | Range Values             | Comments |
|--------------------------|--------------------------------|-----------|--------------------------|----------|
| 5                        | <b>Mission_ID</b>              | yes       | standard                 |          |
| 6                        | <b>AV_Number_Alert_Updates</b> | yes       | standard                 |          |
| 7                        | <b>AV_Alert_1</b>              | yes       | See Outrider Alert Table |          |
| 8                        | <b>AV_Alert_Level_1</b>        | yes       | standard                 |          |
| 9                        | <b>AV_Alert_2</b>              | yes       | See Outrider Alert Table |          |
| 10                       | <b>AV_Alert_Level_2</b>        | yes       | standard                 |          |
| 11                       | <b>AV_Alert_3</b>              | yes       | See Outrider Alert Table |          |
| 12                       | <b>AV_Alert_Level_3</b>        | yes       | standard                 |          |
| 13                       | <b>AV_Alert_4</b>              | yes       | See Outrider Alert Table |          |
| 14                       | <b>AV_Alert_Level_4</b>        | yes       | standard                 |          |
| 15                       | <b>AV_Alert_5</b>              | yes       | See Outrider Alert Table |          |
| 16                       | <b>AV_Alert_Level_5</b>        | yes       | standard                 |          |
| 17                       | <b>AV_Alert_6</b>              | yes       | See Outrider Alert Table |          |
| 18                       | <b>AV_Alert_Level_6</b>        | yes       | standard                 |          |
| 19                       | <b>AV_Alert_7</b>              | yes       | See Outrider Alert Table |          |
| 20                       | <b>AV_Alert_Level_7</b>        | yes       | standard                 |          |
| 21                       | <b>AV_Alert_8</b>              | yes       | See Outrider Alert Table |          |
| 22                       | <b>AV_Alert_Level_8</b>        | yes       | standard                 |          |
| 23                       | <b>AV_Alert_9</b>              | yes       | See Outrider Alert Table |          |
| 24                       | <b>AV_Alert_Level_9</b>        | yes       | standard                 |          |
| 25                       | <b>AV_Alert_10</b>             | yes       | See Outrider Alert Table |          |
| 26                       | <b>AV_Alert_Level_10</b>       | yes       | standard                 |          |
| 27                       | <b>AV_Alert_11</b>             | yes       | See Outrider Alert Table |          |
| 28                       | <b>AV_Alert_Level_11</b>       | yes       | standard                 |          |
| 29                       | <b>AV_Alert_12</b>             | yes       | See Outrider Alert Table |          |
| 30                       | <b>AV_Alert_Level_12</b>       | yes       | standard                 |          |
| 31                       | <b>AV_Alert_13</b>             | yes       | See Outrider Alert Table |          |
| 32                       | <b>AV_Alert_Level_13</b>       | yes       | standard                 |          |
| 33                       | <b>AV_Alert_14</b>             | yes       | See Outrider Alert Table |          |

| AV Warning Message Field | Data Element      | Supported | Range Values             | Comments |
|--------------------------|-------------------|-----------|--------------------------|----------|
| 34                       | AV_Alert_Level_14 | yes       | standard                 |          |
| 35                       | AV_Alert_15       | yes       | See Outrider Alert Table |          |
| 36                       | AV_Alert_Level_15 | yes       | standard                 |          |
| 37                       | AV_Alert_16       | yes       | See Outrider Alert Table |          |
| 38                       | AV_Alert_Level_16 | yes       | standard                 |          |
| 39                       | AV_Alert_17       | yes       | See Outrider Alert Table |          |
| 40                       | AV_Alert_Level_17 | yes       | standard                 |          |
| 41                       | AV_Alert_18       | yes       | See Outrider Alert Table |          |
| 42                       | AV_Alert_Level_18 | yes       | standard                 |          |
| 43                       | AV_Alert_19       | yes       | See Outrider Alert Table |          |
| 44                       | AV_Alert_Level_19 | yes       | standard                 |          |
| 45                       | AV_Alert_20       | yes       | See Outrider Alert Table |          |
| 46                       | AV_Alert_Level_20 | yes       | standard                 |          |
| 47                       | AV_Alert_21       | yes       | See Outrider Alert Table |          |
| 48                       | AV_Alert_Level_21 | yes       | standard                 |          |
| 49                       | AV_Alert_22       | yes       | See Outrider Alert Table |          |
| 50                       | AV_Alert_Level_22 | yes       | standard                 |          |
| 51                       | AV_Alert_23       | yes       | See Outrider Alert Table |          |
| 52                       | AV_Alert_Level_23 | yes       | standard                 |          |
| 53                       | AV_Alert_24       | yes       | See Outrider Alert Table |          |
| 54                       | AV_Alert_Level_24 | yes       | standard                 |          |
| 55                       | AV_Alert_25       | yes       | See Outrider Alert Table |          |
| 56                       | AV_Alert_Level_25 | yes       | standard                 |          |

#### Outrider Alert Table

| Alert ID | Alert Level Range | Alert Text                     |
|----------|-------------------|--------------------------------|
| 2001     | 0<=x<=1           | AV Returning to Recovery Point |
| 2002     | 0<=x<=1           | IBLS Not in Differential Mode  |

| Alert ID | Alert Level Range | Alert Text                            |
|----------|-------------------|---------------------------------------|
| 2003     | 0<=x<=1           | ERP in Control                        |
| 2004     | 0, 2              | DGPS Corrections Not Received at ODCM |
| 2005     | 0, 2              | DGPS Corrections Not Received at AV   |
| 2006     | 0, 2              | FCB Commands Not Received at ODCM     |
| 2007     | 0, 2              | FCB Commands Not Received at AV       |
| 2008     | 0, 2              | No Data From Antenna Pedestal         |
| 2009     | 0, 2              | Lost C-Band Uplink                    |
| 2010     | 0, 2              | Lost UHF Uplink, or ERP Failure       |
| 2011     | 0, 2              | IMU Failed                            |
| 2012     | 0, 2              | IBLS Failed                           |
| 2013     | 0, 2              | ADT Failed (Main Controller)          |
| 2014     | 0, 2              | ADT Failed (Motor Controller)         |
| 2015     | 0, 2              | Airborne GPS Failed                   |
| 2016     | 0, 2              | EEM Failed                            |
| 2017     | 0, 2              | PDP Failed                            |
| 2018     | 0, 2              | Illegal Antenna Setting in ADT        |
| 2019     | 0, 2              | IBLS – No GPS Position                |
| 2020     | 0, 2              | IBLS – RAIM Failure                   |
| 2021     | 0, 2              | IMU is in Inertial Mode (No GPS)      |
| 2022     | 0, 2              | Flight Termination Active             |
| 2023     | 0, 2              | Servo Calibration Table Missing       |
| 2024     | 0, 2              | Waypoint Table Missing                |
| 2025     | 0<=x<=2           | Pitch Excessive                       |
| 2026     | 0<=x<=2           | Roll Excessive                        |
| 2027     | 0<=x<=1           | Airspeed Too High                     |
| 2028     | 0<=x<=1           | Airspeed Too Low                      |
| 2029     | 0<=x<=1           | Engine RPM Too High                   |
| 2030     | 0<=x<=2           | Downlink Quality Low                  |
| 2031     | 0<=x<=2           | ACP Temperature Too High              |
| 2032     | 0<=x<=2           | ACP Temperature Too Low               |
| 2033     | 0<=x<=2           | Alternator Voltage Too High           |
| 2034     | 0<=x<=2           | Alternator Voltage Too Low            |

| Alert ID | Alert Level Range | Alert Text                          |
|----------|-------------------|-------------------------------------|
| 2035     | 0<=x<=2           | Engine Coolant Temperature Too High |
| 2036     | 0<=x<=2           | Rotor Output Temperature Too High   |
| 2037     | 0<=x<=2           | AV Climb Rate Too High              |
| 2038     | 0<=x<=2           | AV Descent Rate Too High            |
| 2039     | 0,2               | Outside of DTED Coverage            |

**Table 8.1.1-2 Outrider Alert Table**

### **8.1.1.15 DCM Protocol Error Message**

| AV IFF Status Message Field | Data Element Name           | Supported | Range Values | Comments |
|-----------------------------|-----------------------------|-----------|--------------|----------|
| 1                           | <b>Message_ID</b>           | yes       | standard     |          |
| 2                           | <b>Message_Version</b>      | yes       | 2            |          |
| 3                           | <b>AV_Type</b>              | yes       | 2            |          |
| 4                           | <b>AV_Tail_Number</b>       | yes       | standard     |          |
| 5                           | <b>Mission_ID</b>           | yes       | standard     |          |
| 6                           | <b>Message_ID</b>           | yes       | standard     |          |
| 7                           | <b>Offending_Message_ID</b> | yes       | standard     |          |
| 8                           | <b>Error_Message</b>        | yes       | standard     |          |

### **8.1.1.16 DCM Mission Load Acknowledge Message**

| DCM Mission Load Acknowledge Message Field | Data Element Name             | Supported | Range Values | Comments |
|--|-------------------------------|-----------|--------------|----------|
| 1  | <b>Message_ID</b>             | yes       | standard     |          |
| 2  | <b>Message_Version</b>        | yes       | 2            |          |
| 3  | <b>AV_Type</b>                | yes       | 2            |          |
| 4  | <b>AV_Tail_Number</b>         | yes       | standard     |          |
| 5  | <b>Mission_ID</b>             | yes       | standard     |          |
| 6  | <b>New_Mission_Plan_ID</b>    | yes       | standard     |          |
| 7  | <b>Mission_Plan_Load_Ack</b>  | yes       | standard     |          |
| 8  | <b>Last_Waypoint_Received</b> | yes       | standard     |          |

### **8.1.1.17 AV Servo Status Message**

This message is not supported by Outrider.

### **8.1.2 TCS to Outrider DCM Messages**

**Below is a summary of the messages sent from the TCS to the Outrider DCM.**

#### **TCS to ODCM Messages**

| Message Name                          | Message ID | Supported | Frequency              |
|---------------------------------------|------------|-----------|------------------------|
| AV Flight Mode Command Message        | 13         | yes       | On TCS operator action |
| AV Flight Envelope Command Message    | 14         | no        |                        |
| AV Lights Command Message             | 24         | yes       | On TCS operator action |
| TCS Position Uplink Message           | 35         | yes       | 1 Hz                   |
| TCS Environmental Data Uplink Message | 27         | no        |                        |

| <b>Message Name</b>                             | <b>Message ID</b> | <b>Supported</b> | <b>Frequency</b>   |
|---|-------------------|------------------|--|
| EOIR Command Message                            | 28                | yes              | Manual Control<br>10Hz, otherwise<br>on TCS operator<br>action |
| AV Analog Video Command Message                 | 22                | no               |  |
| AV Waypoint Begin Message                       | 33                | yes              | 5 Hz during flight<br>route plan<br>transfer only              |
| AV Piston Engine Command Message                | 25                | yes              | On TCS operator<br>action                                      |
| AV IFF Command Message                          | 26                | yes              | On TCS operator<br>action                                      |
| AV Fuel System Command Message                  | 23                | yes              | On TCS operator<br>action                                      |
| Ground Line of Sight Datalink Command Message   | 29                | yes              | On TCS operator<br>action                                      |
| Airborne Line of Sight Datalink Command Message | 30                | yes              | On TCS operator<br>action                                      |
| Airborne SATCOM Datalink Command Message        | 31                | no               |  |

**Table 8.1.2-1 TCS to ODCM Messages**

### **8.1.2.1 AV Flight Mode Command Message**

| <b>AV Flight<br/>Mode<br/>Command<br/>Message<br/>Field</b> | <b>Data Element Name</b> | <b>Supported</b> | <b>Range Values</b> | <b>Comments</b> |
|---|--------------------------|------------------|---------------------|-----------------|
| 1   | <b>Message_ID</b>        | yes              | 13                  |                 |
| 2   | <b>Message_Version</b>   | yes              | 2                   |                 |
| 3   | <b>AV_Type</b>           | yes              | 2                   |                 |

| AV Flight Mode Command Message Field | Data Element Name        | Supported | Range Values     | Comments  |
|--------------------------------------|--------------------------|-----------|------------------|---|
| 4                                    | AV_Tail_Number           | yes       | standard         |   |
| 5                                    | Mission_ID               | yes       | standard         |   |
| 6                                    | Mission_Command.         | yes       | standard         |   |
| 7                                    | AV_Flight_mode           | yes       | 1 <= x <= 8      | 7 = Camera guide mode.<br>8 = Achieve new altitude in minimum time.   |
| 8                                    | AV_Activate_New_Mission  | yes       | standard         |   |
| 9                                    | AV_New_Mission_ID        | yes       | standard         |   |
| 10                                   | AV_Set_Altitude          | no        | 0                |   |
| 11                                   | AV_New_Altitude          | no        | 0                |   |
| 12                                   | AV_Set_Climb_Rate        | no        | 0                |   |
| 13                                   | AV_New_Climb_Rate        | no        | 0                |   |
| 14                                   | AV_Set_Airspeed          | yes       | 0                | Only used in waypoint mode. If this field is 0 in a waypoint, then the AV shall determine airspeed by the Flight Mode and/or the Arrival Time |
| 15                                   | AV_New_Airspeed          | yes       | 0,50 <= x <= 110 |   |
| 16                                   | AV_New_Airspeed_Sensor   | no        | 0                |   |
| 17                                   | AV_New_AOA_Sensor_Active | no        | 0                |   |
| 18                                   | AV_Set_Heading           | no        | 0                |   |
| 19                                   | AV_New_Heading           | no        | 0                |   |
| 20                                   | AV_Fly_To_Latitude       | yes       | standard         |   |
| 21                                   | AV_Fly_To_Longitude      | yes       | standard         |   |
| 22                                   | AV_Fly_To_Altitude       | yes       | standard         |   |
| 23                                   | AV_Arrival_Time_Weeks    | yes       | standard         |   |
| 24                                   | AV_Arrival_Time_Second   | yes       | standard         |   |
| 25                                   | AV_Loiter_Latitude       | yes       | standard         |   |
| 26                                   | AV_Loiter_Longitude      | yes       | standard         |   |
| 27                                   | AV_Loiter_Altitude       | yes       | standard         |   |
| 28                                   | AV_Loiter_Pattern        | yes       | standard         |   |

| AV Flight Mode Command Message Field | Data Element Name       | Supported | Range Values | Comments |
|--------------------------------------|-------------------------|-----------|--------------|----------|
| 29                                   | AV_Loiter_Length        | yes       | standard     |          |
| 30                                   | AV_Loiter_Width         | yes       | standard     |          |
| 31                                   | AV_Loiter_Orientation   | yes       | standard     |          |
| 32                                   | AV_Loiter_Time          | no        | 0            |          |
| 33                                   | AV_Loiter_Loops         | yes       | standard     |          |
| 34                                   | AV_Loiter_Time_Or_Loops | yes       | 1            |          |
| 35                                   | AV_Set_Next_Waypoint    | yes       | standard     |          |
| 36                                   | AV_New_Next_Waypoint    | yes       | standard     |          |

### 8.1.2.2 AV Flight Envelope Command Message

Outrider does not support this message.

### 8.1.2.3 AV Lights Command Message

| AV Lights Command Message Field | Data Element Name | Supported | Range Values | Comments |
|---------------------------------|-------------------|-----------|--------------|----------|
| 1                               | Message_ID        | yes       | 24           |          |
| 2                               | Message_Version   | yes       | 2            |          |
| 3                               | AV_Type           | yes       | 2            |          |

| AV Lights Command Message Field | Data Element Name          | Supported | Range Values | Comments |
|---------------------------------|----------------------------|-----------|--------------|----------|
| 4                               | AV_Tail_Number             | yes       | standard     |          |
| 5                               | Mission_ID                 | yes       | standard     |          |
| 6                               | Mission_Command.           | yes       | standard     |          |
| 7                               | AV_Nav_Lights              | yes       | standard     |          |
| 8                               | AV_Strobe_Lights           | yes       | standard     |          |
| 9                               | AV_Landing_Lights          | no        | 0            |          |
| 10                              | AV_Rad_Haz_Strobe          | no        | 0            |          |
| 11                              | AV_Lights_Out_Range        | no        | 0            |          |
| 12                              | AV_Lights_Out_Range_Enable | no        | 0            |          |

#### 8.1.2.4 TCS Position Uplink Message

| Field | Data Element Name      | Supported | Range Values | Comments |
|-------|------------------------|-----------|--------------|----------|
| 1     | Message_ID             | yes       | standard     |          |
| 2     | Message_Version        | yes       | 2            |          |
| 3     | AV_Type                | yes       | 2            |          |
| 4     | AV_Tail_Number         | yes       | standard     |          |
| 5     | Mission_ID             | yes       | standard     |          |
| 6     | Mission_Command.       | yes       | standard     |          |
| 7     | TCS_Latitude           | yes       | standard     |          |
| 8     | TCS_Longitude          | yes       | standard     |          |
| 9     | TCS_Altitude           | yes       | standard     |          |
| 10    | TCS_Magnetic_Variation | yes       | standard     |          |

#### 8.1.2.5 TCS Environmental Data Uplink Message

Outrider does not support this message.

### 8.1.2.6 AV EOIR Command Message

| AV EOIR Command Message Field | Data Element Name                 | Supported | Range Values | Comments |
|-------------------------------|-----------------------------------|-----------|--------------|----------|
| 1                             | <b>Message_ID</b>                 | yes       | 28           |          |
| 2                             | <b>Message_Version</b>            | yes       | 2            |          |
| 3                             | <b>AV_Type</b>                    | yes       | 2            |          |
| 4                             | <b>AV_Tail_Number</b>             | yes       | standard     |          |
| 5                             | <b>Mission_ID</b>                 | yes       | standard     |          |
| 6                             | <b>Mission_Command.</b>           | yes       | standard     |          |
| 7                             | <b>EOIR_Identifier</b>            | yes       | standard     |          |
| 8                             | <b>EO_Power</b>                   | yes       | standard     |          |
| 9                             | <b>IR_Power</b>                   | yes       | standard     |          |
| 10                            | <b>EOIR_Payload_Active</b>        | yes       | standard     |          |
| 11                            | <b>EOIR_Payload_Pointing_Mode</b> | yes       | 0 <= x <= 1  |          |
| 12                            | <b>EOIR_Pointer_Latitude</b>      | yes       | standard     |          |
| 13                            | <b>EOIR_Pointer_Longitude</b>     | yes       | standard     |          |
| 14                            | <b>EOIR_Pointer_Altitude</b>      | yes       | standard     |          |
| 15                            | <b>EOIR_Depression</b>            | yes       | standard     |          |
| 16                            | <b>EOIR_Azimuth</b>               | yes       | standard     |          |
| 17                            | <b>EOIR_Depression_Rate</b>       | no        | 0            |          |
| 18                            | <b>EOIR_Azimuth_Rate</b>          | no        | 0            |          |
| 19                            | <b>EO_Payload_Camera_Select</b>   | yes       | 1            |          |
| 20                            | <b>EO_Payload_Zoom</b>            | yes       | standard     |          |
| 21                            | <b>EO_Payload_Focus</b>           | yes       | standard     |          |

| AV EOIR Command Message Field | Data Element Name          | Supported | Range Values | Comments |
|-------------------------------|----------------------------|-----------|--------------|----------|
| 22                            | EO_Iris                    | yes       | standard     |          |
| 23                            | IR_Payload_Camera_Select   | yes       | 1            |          |
| 24                            | IR_Payload_Zoom            | yes       | standard     |          |
| 25                            | IR_Payload_Focus           | yes       | standard     |          |
| 26                            | IR_Contrast                | yes       | standard     |          |
| 27                            | IR_Gain                    | yes       | standard     |          |
| 28                            | IR_White_Hot               | yes       | standard     |          |
| 29                            | IR_Auto_Gain_Recalibration | no        | 0            |          |

#### 8.1.2.7 AV Analog Video Command Message

Outrider does not currently support this message.

#### 8.1.2.8 AV Waypoint Begin Message

| AV Waypoint Begin Message Field | Data Element Name | Supported | Range Values | Comments |
|---------------------------------|-------------------|-----------|--------------|----------|
| 1                               | Message_ID        | yes       | standard     |          |
| 2                               | Message_Version   | yes       | 2            |          |
| 3                               | AV_Type           | yes       | 2            |          |
| 4                               | AV_Tail_Number    | yes       | standard     |          |
| 5                               | Mission_ID        | yes       | standard     |          |
| 6                               | Mission_Command.  | yes       | standard     |          |

| AV<br>Waypoint<br>Begin<br>Message<br>Field | Data Element Name   | Supported | Range Values | Comments |
|---|---|-----------|--------------|----------|
| 7   | <b>AV_Flight_Route_Plan_ID</b>                              | yes       | standard     |          |
| 8   | <b>AV_Waypoint_Number</b>                                   | yes       | standard     |          |
| 9   | <b>AV_Number_Waypoints_In_Plan</b>                          | yes       | standard     |          |
| 10  | <b>AV_Number_Commands_In_Wayp<br/>oint</b>                  | yes       | standard     |          |
| 11  | <b>AV_Waypoint_Emergency_Action</b>                         | yes       | standard     |          |
| 12  | <b>AV_Emergency_Plan_Delay</b>                              | yes       | standard     |          |
| 13  | <b>AV_Emergency_Plan_Conditional_</b><br><b>Select_Mode</b> | no        |              |          |
| 14  | <b>AV_Emergency_Plan_ID_1</b>                               | yes       | standard     |          |
| 15  | <b>AV_Emergency_Plan_ID_2</b>                               | no        |              |          |
| 16  | <b>AV_Emergency_Plan_ID_3</b>                               | no        |              |          |
| 17  | <b>AV_Emergency_Plan_ID_4</b>                               | no        |              |          |

### 8.1.2.9 AV Piston Engine Command Message

| AV Piston<br>Engine<br>Command<br>Message<br>Field | Data Element Name      | Supported | Range Values | Comments |
|--|------------------------|-----------|--------------|----------|
| 1  | <b>Message_ID</b>      | yes       | standard     |          |
| 2  | <b>Message_Version</b> | yes       | 2            |          |
| 3  | <b>AV_Type</b>         | yes       | 2            |          |
| 4  | <b>AV_Tail_Number</b>  | yes       | standard     |          |

| AV Piston Engine Command Message Field | Data Element Name                    | Supported | Range Values   | Comments |
|--|--------------------------------------|-----------|----------------|----------|
| 5                                      | <b>Mission_ID</b>                    | yes       | standard       |          |
| 6                                      | <b>Mission_Command.</b>              | yes       | standard       |          |
| 7                                      | <b>Engine_ID</b>                     | yes       | 2              |          |
| 8                                      | <b>Engine_Speed_Hold</b>             | yes       | standard       |          |
| 9                                      | <b>Engine_Speed</b>                  | yes       | 0 <= x <= 6000 |          |
| 10                                     | <b>Engine_Start</b>                  | no        | 0              |          |
| 11                                     | <b>Engine_Enable_Toggle</b>          | yes       | standard       |          |
| 12                                     | <b>Engine_Cooling_Fan</b>            | no        | no             |          |
| 13                                     | <b>Engine_Ignition_Coil_1_Enable</b> | no        | 0              |          |
| 14                                     | <b>Engine_Ignition_Coil_2_Enable</b> | no        | 0              |          |

#### 8.1.2.10 AV IFF Command Message

Outrider does not currently support this message.

#### 8.1.2.11 AV Fuel System Command Message

| AV Fuel System Command Message Field | Data Element Name | Supported | Range Values | Comments |
|--------------------------------------|-------------------|-----------|--------------|----------|
|                                      |                   |           |              |          |

| AV Fuel System Command Message Field | Data Element Name                        | Supported | Range Values       | Comments |
|--------------------------------------|--|-----------|--------------------|----------|
| 1                                    | <b>Message_ID</b>                        | yes       | standard           |          |
| 2                                    | <b>Message_Version</b>                   | yes       | 2                  |          |
| 3                                    | <b>AV_Type</b>                           | yes       | 2                  |          |
| 4                                    | <b>AV_Tail_Number</b>                    | yes       | standard           |          |
| 5                                    | <b>Mission_ID</b>                        | yes       | standard           |          |
| 6                                    | <b>Mission_Command.</b>                  | yes       | standard           |          |
| 7                                    | <b>Fuel_Tank_ID</b>                      | yes       | 0                  |          |
| 8                                    | <b>AV_Engine_1_Fuel_Source_Tank</b>      | no        | 0                  |          |
| 9                                    | <b>AV_Engine_2_Fuel_Source_Tank</b>      | no        | 0                  |          |
| 10                                   | <b>AV_Fuel_Tank_Transfer_Rate</b>        | no        | 0                  |          |
| 11                                   | <b>AV_Fuel_Transfer_Source_Tank</b>      | no        | 0                  |          |
| 12                                   | <b>AV_Fuel_Transfer_Destination_Tank</b> | no        | 0                  |          |
| 13                                   | <b>AV_Fuel_Start_Of_Flight</b>           | yes       | $0 \leq x \leq 80$ |          |

### 8.1.2.12 Ground Line of Sight Datalink Control Message

| Ground Line of Sight Datalink Control Message Field | Data Element Name | Supported | Range Values | Comments |
|---|-------------------|-----------|--------------|----------|
|   |                   |           |              |          |

| Ground Line of Sight Datalink Control Message Field | Data Element Name                      | Supported | Range Values | Comments |
|---|--|-----------|--------------|----------|
| 1   | <b>Message_ID</b>                      | yes       | standard     |          |
| 2   | <b>Message_Version</b>                 | yes       | 2            |          |
| 3   | <b>AV_Type</b>                         | yes       | 2            |          |
| 4   | <b>AV_Tail_Number</b>                  | yes       | standard     |          |
| 5   | <b>Mission_ID</b>                      | yes       | standard     |          |
| 6   | <b>Mission_Command.</b>                | yes       | standard     |          |
| 7   | <b>LOS_GDT_Uplink_Power_1</b>          | yes       | standard     |          |
| 8   | <b>LOS_GDT_Uplink_Power_2</b>          | no        | 0            |          |
| 9   | <b>LOS_GDT_Uplink_Frequency_1</b>      | yes       | standard     |          |
| 10  | <b>LOS_GDT_Uplink_Frequency_2</b>      | no        | 0            |          |
| 11  | <b>LOS_GDT_Downlink_Frequency_1</b>    | yes       | standard     |          |
| 12  | <b>LOS_GDT_Downlink_Frequency_2</b>    | no        | 0            |          |
| 13  | <b>LOS_GDT_Transmitter_Selected</b>    | no        | 0            |          |
| 14  | <b>LOS_GDT_Cooling_Mode</b>            | no        | 0            |          |
| 15  | <b>LOS_GDT_Power</b>                   | yes       | standard     |          |
| 16  | <b>LOS_GDT_Transmit_Antenna_Select</b> | yes       | standard     |          |
| 17  | <b>LOS_GDT_Receive_Antenna_Select</b>  | yes       | standard     |          |
| 18  | <b>LOS_GDT_Tracking_Mode</b>           | yes       | standard     |          |
| 19  | <b>LOS_GDT_Pointing_Azimuth</b>        | yes       | standard     |          |
| 20  | <b>LOS_GDT_Pointing_Elevation</b>      | yes       | standard     |          |

### 8.1.2.13 Airborne Line of Sight Datalink Control Message

| Airborne Line of Sight Datalink Control Message Field | Data Element Name                    | Supported | Range Values | Comments |
|---|--------------------------------------|-----------|--------------|----------|
| 1   | <b>Message_ID</b>                    | yes       | standard     |          |
| 2   | <b>Message_Version</b>               | yes       | 2            |          |
| 3   | <b>AV_Type</b>                       | yes       | 2            |          |
| 4   | <b>AV_Tail_Number</b>                | yes       | standard     |          |
| 5   | <b>Mission_ID</b>                    | yes       | standard     |          |
| 6   | <b>Mission_Command.</b>              | yes       | standard     |          |
| 7   | <b>AV_LOS_Ch_1_Uplink_Freq</b>       | yes       | standard     |          |
| 8   | <b>AV_LOS_Ch_2_Uplink_Freq</b>       | yes       | standard     |          |
| 9   | <b>AV_LOS_Ch_1_Downlink_Freq</b>     | yes       | standard     |          |
| 10  | <b>AV_LOS_Ch_2_Downlink_Freq</b>     | yes       | standard     |          |
| 11  | <b>AV_LOS_ADT_Antenna_Selected</b>   | yes       | standard     |          |
| 12  | <b>AV_LOS_ADT_Pointing_Mode</b>      | yes       | standard     |          |
| 13  | <b>AV_LOS_Pointing_Azimuth</b>       | yes       | standard     |          |
| 14  | <b>AV_LOS_Pointing_Elevation</b>     | yes       | standard     |          |
| 15  | <b>AV_LOS_ADT_Transmitter_1_Mode</b> | yes       | standard     |          |
| 16  | <b>AV_LOS_ADT_Transmitter_2_Mode</b> | no        | 0            |          |
| 17  | <b>AV_LOS_ADT_Tx_1_Power</b>         | yes       | standard     |          |
| 18  | <b>AV_LOS_ADT_Tx_2_Power</b>         | no        | 0            |          |

#### 8.1.2.14 Airborne SATCOM Datalink Control Message

Outrider does not support this message.

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